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THE GRASSES OF PENNSYLVANIA

By

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State Botanist

BUREAU OF PLANT INDUSTRY
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HARRISBURG, PENNSYLVANIA,

1924



THE GRASSES OF PENNSYLVANIA

[A MANUAL INCLUDING KEYS, DESCRIPTIONS,
ILLUSTRATIONS AND KNOWN DISTRIBUTION
IN THE STATE]

BY

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AGRICULTURE.



HARRISBURG, PENNSYLVANIA.

1924



LETTER OF TRANSMITTAL

Harrisburg, Pennsylvania,

May 1, 1924.

Hon. Frank P. Willits,

Secretary of Agriculture.

Sir:—

I beg to submit for publication as a Technical Bulletin, a manuscript and illustrations embodying a treatise on the Grasses of Pennsylvania.

From an agricultural standpoint the grasses, to which group belong most of the cereals and forage plants cultivated by the farmer, are most valuable and useful.

Among the grasses also are some of the most noxious weeds found in the state, such as quack grass, crab grass, and others. These are described, illustrated and accompanied by notes on distribution and method of control.

The publication and distribution of this illustrated treatise will be of great value and use to the farmer, to the gardener, to the high school student, to college and university students, and to the public in general.

Yours very truly,

Charles H. Hadley,

Director, Bureau of Plant Industry.



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FOREWORD

This publication, on "The Grasses of Pennsylvania" discusses about 250 species and varieties of grasses, all of which have been reported from the state and with very few exceptions, as noted in the text, are definitely known to have been found in the state. The herbarium of the Philadelphia Academy of Science and the herbarium of the Carnegie Museum at Pittsburgh, each contains specimens of almost all of the grasses listed.

The descriptions have been made from specimens collected by the writer or from verified specimens in the above herbaria, with modified applicable descriptions from previous authentic works. In a few cases where specimens were not available, as noted in the text, the descriptions were compiled or quoted from earlier authors.

The illustrations have been drawn by the writer except those on *Panicum spp.* which were borrowed from the National Herbarium of Washington, D. C. All drawings except the two diagrams of the floret and spikelet and the three illustrations showing the structure of the floret, as acknowledged in the text, have been made from fresh or from mounted material.

The distribution of grasses in the state has been recorded from mounted herbarium specimens, from previous authentic publications, and from specimens collected by the writer and by others, some of which are in the recently established Herbarium of the Pennsylvania Bureau of Plant Industry, at Harrisburg, Pa. The distribution as recorded is very incomplete, due to the fact that no collecting at all has been done in many parts of the state. There are counties in the state from which there is not a single specimen of grass in any of the herbaria, so far as is known. It does not follow that there is a scarcity of grasses in those counties but that they have not been collected and preserved. It is hoped that this publication may be the means of interesting a few persons in those counties not represented as well as elsewhere, and that specimens may be received and recorded from every county in the state.

It may appear to some readers that the author has been inconsistent in the use of synonyms. In reviewing the herbarium specimens, collected during the last century, many synonymous terms have been encountered, some of which have been justly dropped from recent publications. Some of these synonyms with dates and references have been included, while others have been omitted. Unfortunately, botanists are not agreed on the use of synonyms and there may be some criticism on the way in which some have been used in this publication. In order to give assistance to others who

might meet with the same difficulties encountered by the author in making comparisons with herbarium specimens, certain synonyms are herein reproduced.

I am indebted to the late Prof. Stewardson Brown, Curator of the Herbarium of the Philadelphia Academy of Science of Philadelphia, Pennsylvania, who kindly permitted the examination of the specimens in his excellent collection and who also rendered assistance in the identification and distribution of some rare species.

To Dr. O. E. Jennings, Curator of the Herbarium of the Carnegie Museum and Professor of Botany of the University of Pittsburgh, the author acknowledges his deep obligation not only for the use of the Herbarium but also for the guidance and able assistance which he has rendered so willingly in the preparation of this work. To him also I am very grateful for awakening in me a deep interest in Botany and for the inspiration and encouragement which he has given me during the several years while working under his directions.

I am also indebted to Dr. A. S. Hitchcock and Agnes Chase of the U. S. National Museum of Washington, D. C., for many valuable suggestions in the preparation of this publication.

ERNEST M. GRESS,

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Department of Agriculture.*

SUGGESTIONS TO AMATEUR BOTANISTS

It seems to be the generally accepted opinion of amateur botanists that the grasses are a difficult group of plants to study. As a result most of our common plants are passed by with little interest and attention with the remark, "It is only a grass"! If a little time and patience is taken to study the structure of grasses and to analyze the meaning of limited number of terms, applicable only to the grasses, as explained in the introduction of this bulletin, it will be found that the grasses not only are not so difficult to study but that they are indeed, very interesting and fascinating.

The first step involves a study of the "Introduction" of this bulletin preferably with specimens in hand, of common grasses such as bluegrass, redtop, chess or cheat, orchard grass, timothy, and oats, at first giving little attention to the spikelets.

Later, in studying the spikelet a few instruments are necessary. A hand lens, preferably a tripod (a lens mounted on a frame with three legs), two needles (sewing needles pushed into soft pine wood for handles answer very well), a pair of forceps, and a small piece of glass.

Select a grass in which the spikelets are not crowded together into dense clusters or spikes. Such grasses as chess, fescue or bluegrass are best. Remove a spikelet with a pair of forceps, hold it in water for a few minutes to soften it, place it on the glass under the lens, focus the lens and with a needle in each hand carefully dissect it. Remove the two glumes below, then remove one floret at a time and find the lemma and palea. Notice how many florets are in the spikelet and whether the spikelet, if ripe, would fall off entire or whether it would leave the glumes attached by breaking loose above them. At first little attention need be given to the lodicules, stamens and pistils.

After studying a few specimens as suggested above, one will be able to use the "Key to the Tribes" (page 29) and the "Key to the Genera" (page 29), thus locating the genus to which the grass belongs. The genus key may then be used to find the species. Plant keys are always discouraging things to amateur botanists. It should be kept in mind that a key is merely an outline of plants in which the marked characteristics are given. In using a key one need only to go through it as he would an outline, to locate in the key or outline, the place in which the plant in question belongs.

If the generic and specific descriptions do not fit the plant under consideration, then an error has been made in following the key and a new start must be made with more care and observation. Don't be discouraged! Even the professional botanist finds it necessary

to do this at times. After some experience the genus, in many cases, may be recognized from the general appearance of the plant.

In collecting specimens for study or for pressing and mounting, typical plants in bloom or in fruit should be taken. The general appearance of the plant in the field should be studied. It should be noted whether the plants are single, or in bunches; whether erect, bent or creeping; whether growing in moist, dry or rocky places. The plant should be taken up with the root intact to see whether it possesses an underground rootstock or a stolon running along on the top of the ground. It should also be noted whether the plant lives from year to year (perennial), dying down to the ground in winter and branching up from the same roots the next spring, or whether it comes from seeds each year (annual). This is not always easy to determine.

If the specimen is to be pressed and mounted, avoid taking too much material. One or two well-pressed and well-mounted plants on each sheet will show the characteristics better than would a large bunch of material. The pressing may be done between blotters or between sheets of newspaper. The pressure can be obtained by placing the plants between two boards and placing them under weight. The plants should be dried quickly in order to preserve the color.

When the plants are thoroughly dry, they may be mounted on a good grade of glazed white linen paper ($11\frac{1}{2}$ inches by $16\frac{1}{2}$ inches). Too much glue must not be used in mounting. With some of the very delicate grasses, it is probably better to avoid the use of glue, fastening the specimens to the sheets with strips of gummed muslin. On the lower right-hand corner of the sheets should be placed a label containing (1) the name of the plant, (2) the date collected, (3) the locality and state, (4) the name of the collector, and (5) any other data of interest. The plants are then ready to be placed in the herbarium.

Plants are often attacked by insects (book lice, Psocids). These creatures may be repelled by placing in the container some moth balls, powdered naphthalene, or by poisoning the plant before mounting with a nearly-saturated solution of bichloride of mercury in alcohol, applied to the specimens with an atomizer. [E. M. G.]

ABBREVIATIONS USED

mm.....	millimeter, about $1/25$ inch.
cm.	centimeter, about $2/5$ inch.
dm.	10 cm., about 4 inches.
m.	meter, $39\ 2/5$ inches.
B. H. P.	B. H. Patterson.
J. A. S.	John A. Shafer.
O. E. J.	O. E. Jennings.
E. M. G.	E. M. Gress.
G. K. J.	Grace K. Jennings.

THE GRASSES OF PENNSYLVANIA

GENETIC RELATIONSHIPS

The grasses, which constitute the family Poaceae, belong to the monocotyledonous division of the angiosperms. It was once thought that the monocotyledons were primitive angiosperms; but a study of the development of the stem structure reveals the fact that they have probably been derived from the dicotyledons. This is particularly shown in the study of the development of the vascular system. In the dicotyledons the characteristic arrangement of the vascular bundles is in the form of a hollow cylinder with the xylem on the inside and the phloem on the outside of the cylinder. This arrangement of the vascular bundles, which is the permanent arrangement in nearly all of the adult dicotyledonous stems, is observed in the embryo of most monocotyledonous stems. As the monocotyledonous stem continues its development, two subsequent stages are observed. In the first of these two stages it is found that the xylem entirely surrounds the phloem of each bundle instead of remaining on the inside of each bundle as is the case with the adult dicotyledonous stem. In the next stage which follows, it is found that the bundles begin to separate one from the other, and instead of being arranged in the form of a hollow cylinder, they are scattered through the pith and all parts of the stem which feature is so well shown in a cross-section of the common corn stem.

There are some dicotyledonous plants in whose stems the hollow cylinder of vascular bundles is broken up in the same way as is the adult monocotyledonous stems. These dicotyledons are found among those plants which either have no petals or in which the petals are entirely free from one another as in the Archichlamydeae, a class of plants considered more primitive than those like the Sympetalae in which the petals are grown together.

Some of these dicotyledons having scattered vascular bundles are found among such genera as *Castalia*, *Podophyllum*, *Ranunculus*, and *Rheum* to which group may be attributed the origin of our monocotyledonous plants.

If the geological gap between the Gymnosperms and the Angiosperms were not so wide there probably would be less uncertainty as to the origin of the monocotyledons. Seward¹ in his discussion of fossil monocotyledons says, "The evidence at present available does in Pre-cretaceous strata." Many fossil plants found in strata earlier not, I believe, afford any proof of the existence of monocotyledons than the Cretaceous have been assigned to the monocotyledonous

¹Annals of Botany, Vol. 10; no. 38.

division of the Angiosperms. Seward, as well as other authors, thinks that these fossils belong to Gymnosperms, ferns or some other groups and not to the Angiosperms. Miss Sargent¹ thinks that the monocotyledons have been derived from the dicotyledons or that both have sprung from a common Angiospermous ancestry.

The investigations by other recent writers evidently support this view. Among these is the work by Amon B. Plowman² on "The Comparative Anatomy and Phylogeny of the Cyperaceae."

THE RELATION OF THE GRAMINALES TO THE MONOCOTYLEDONS³

It is not known definitely where the Graminales branch of the dence seems to support the view that the flower of the grasses has phylogenetic monocotyledonous tree should originate. Recent evidence derived by reduction from a flower similar to that of the Liliales.

The typical flower of the lily consists of one whorl of three sepals, one whorl of three petals, two whorls of three stamens each, and one pistil composed of three carpels. Some of the grasses, such as the bamboos, probably the most primitive, have a perianth (sepals and petals) of only one whorl of three scales called lodicules and one whorl of three stamens. The pistil which has but one locule shows its origin from a tricarpeal type in the fact that it has three branches at the top. The axis of the spike has been shortened and inclosed in two bracts similar to the glumes in the grasses. Our ordinary grasses have undergone further reduction than the bamboo just described. In his discussion of the phylogeny of the grasses, Bessey says, "Thus we see that the ordinary grass flower consists of a tricarpeal pistil, one or two whorls of three stamens each, an incomplete whorl of petals (lodicules), and an incomplete whorl of sepals (united to form the palea), this flower being seated in the axil of a single bract (the lemma)."

CLASSIFICATION AND CHARACTERISTICS

The order Graminales consists of two families, the Poaceae or grasses, and the Cyperaceae or sedges.

The grasses are herbaceous plants with the exception of the Tribe Bambuseae which consists of shrubs and trees whose reed-like stems are familiar in the bamboo fishing-rods, canes and articles of furniture. The grass stem, called a "culm," usually is hollow with solid

¹Sargent. The Evolution of Monocotyledons. Botanical Gazette, 37:5, 325-345, 1904; A Theory of the Origin of Monocotyledons, founded on the Structure of their Seedlings. Annals of Botany 17:1, 1-92. 7 plates, 10 figs., 1903.

²Contributions from the Phaeoecologic Laboratories of Harvard University, no. 2. (Annals of Botany 20:77, 1906.)

³For a more complete discussion of the origin of grasses see the following: Bessey, Ernst A. Michigan Academy of Science, 19th report, 1917; Lamb, Wm. H., "The Phylogeny of Grasses," The Plant World, 15: 264-269, 1912; Plowman, Amon B., "The Comparative Anatomy and Phylogeny of the Cyperaceae," Annals of Botany 20: 77, 1906. This has a good bibliography; Jeffrey, Edward Charles, "The Anatomy of Woody Plants," Chapter 20, 1917.

nodes and two-ranked parallel-veined leaves consisting of (1) a part encircling the stem called the "sheath" and (2) a free part called the "blade." In a few grasses the center of the stem is filled with a soft spongy pith, as in our well-known cultivated corn (*Zea mays*.)

A very noticeable characteristic of the sedges is that usually they have triangular solid stems with three-ranked leaves. Also very marked differences are found between the flowers and fruits of the grasses and sedges which can be observed easily in comparing the two, or can be obtained from any Manual which includes the grasses and sedges.

GROSS ANATOMY OF GRASS

Roots.

The roots of grasses are fibrous. They originate at the base of the stem or from nodes farther up on the stem. In corn, roots will be found originating from one or more of the nodes immediately above the ground. These "prop roots" grow out obliquely and enter the ground, thus acting as supports to the tall stem. In some grasses whose stems are prostrate upon the ground, roots will be found originating at many of the nodes.

Stems.

[Fig. 1.]

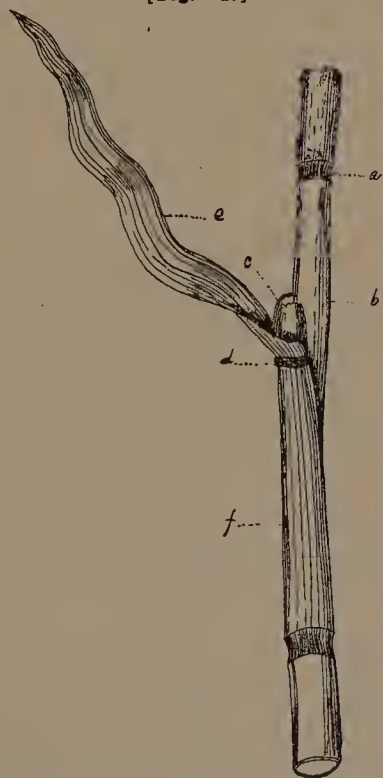


Fig. 1. Portion of stem and leaf. *a.* node, *b.* internode, *c.* ligule, *d.* collar, *e.* leaf blade, *f.* leaf sheath.

The stem of grasses, called a culm, is composed of nodes and internodes. The internodes of the mature plants are hollow, the pith

which was present in the young stem having disappeared. The node, which can be distinguished easily from the internode by its difference in color, texture, or pubescence, is solid, thus forming partitions between the hollow internodes. The swelling of the leaf at its origin must not be mistaken for the node of the stem. The culms of grasses are usually cylindrical; however, in some, such as *Poa compressa*, the stem is flattened. The triangular form found in sedges does not occur among the grasses. In stems which lie upon the ground, it is the function of the node to keep the tip of the stem upright. The node near the tip of the stem elongates on the side toward the ground thus bending the tip up; the upper side of the node then elongates causing the stem to be pushed toward the ground or in a decumbent position. The succeeding younger node growing in like manner consequently keeps the tip of the culm always erect, however far the culm may creep along on top of the ground. The herbaceous stems are annual, perennial stems being found among the woody grasses such as bamboos. Grasses whose herbaceous stems grow erect or nearly so, dying back to the base in the winter and sending up new shoots from the base of the old culms, usually form bunches, or tussocks. An example of such a grass is our common orchard grass (*Dactylis glomerata*). Those grasses whose stems creep along on top of the ground take root at the nodes and send up new shoots at some distance from the original roots, usually form a flat, even sod. Such grasses are much better suited for making lawns.

Rhizomes.

Stems which creep along underneath the ground and send up one or more shoots at various places are called "rhizomes" or root-stocks. These can be distinguished from roots by the short leaf-like structures called "scales." If the rhizomes are short, the grass will form more or less well-developed bunches or tussocks. Such grasses will form a rather uneven sod. If the rhizomes are long and slender, sending up shoots at some distance from the old root, the sod will be smooth and even. This kind of grass, of which Kentucky blue grass is an example, is very useful in the formation of smooth even lawns.

Stolons.

When the creeping stem runs along on top of the ground it is called a "stolon" or runner. The stolons and rhizomes differ from each other in their leaves. The leaves of the stolon are intermediate between the scales of the rhizome and the leaves of the culm. It must be remembered that both stolons and rhizomes differ from creeping or decumbent stems, the former both being modified stems whose sole purpose is that of propagation.

Corms.

In a few grasses the internode at the base of the culm is enlarged and solid, forming what is called a "corm." A rather small corm is found at the base of our ordinary timothy. In some grasses successive corms are formed with constrictions between them. These constrictions are the nodes and the corms are two successive internodes. Buds growing from this kind of underground stem originate from the constrictions or nodes and not from the corm or internode.

Leaves.

The leaves of grasses originate at the nodes and usually consist of two parts, the "sheath" which envelopes the culm and the "blade" or the narrow, flat, free portion which we ordinarily call the leaf. The sheath and the blade are usually separated by an appendage called the "ligule" on the side next to the stem. Leaves on grasses are two-ranked, while those of the sedges are three-ranked. The leaves are often very much reduced. These small reduced leaves are called "scales" when they are found near the base of the culm or below the foliage leaves, or "bracts" when they are found near the inflorescence or above the foliage leaves. These scales and bracts are the sheath, the blade having failed to develop.

Prophyllum.

Buds which form new shoots originate inside the sheath at a node. Between this bud or shoot and the main stem or culm is a small leaf-like structure called the "prophyllum."

Buds and Young Shoots.

When a bud or young shoot bursts through the sheath, the term "extravaginal" is applied to it. When the shoot grows up along the parent stem inside the sheath and emerges from the sheath at its top, the term "intravaginal" is applied to the shoot.

Sheath.

In our ordinary leaves of trees, there is usually a "petiole" and a "blade", the portion corresponding to the sheath of grasses is really lacking or is represented by the somewhat expanded portion of the petiole where it is attached to the stem. This is the real base of the leaf. In the grass, therefore, the sheath is the base of the leaf. If a petiole were present in the grass, as is true in a few, it would be found between the sheath and the blade. The sheath is usually open on the side opposite the blade. In some grasses, however, the edges overlap, the right and left margins alternately overlapping in two successive leaves. The sheath usually fits closely to the stem but in some cases it is loose and inflated. An example of a loose sheath is found in the uppermost sheath of *Elymus virginicus*, one of the common wild ryes.

Sheath Node.

In many grasses, the sheath is swollen at the base. This swelling or sheath node is frequently pubescent and colored. By removing the sheath and observing closely, it will be seen that this "sheath node" is not the "culm node" as one may assume at first sight.

Ligule.

The "ligule" is an appendage found on nearly all grasses on the inside of the leaf at the junction of the sheath and the blade. The form and structure of the ligule differ very much in different genera and species, but are quite constant in the same species and, therefore, are very useful in the identification of grasses. The ligule may be of a texture similar to that of the leaf with some of the nerves of the sheath extending into it, when it is called "keeled." It may be very thin and almost transparent (hyaline), or it may consist of a row of hairs.

Collar.

On the outside of the leaf, at the junction of the sheath and blade, is found a line or zone distinguished by its texture, color or pubescence which is called the "collar."

Blade.

The blades of grasses differ very much in texture, venation, comparative length and width and degree of pubescence. Ecological factors influence, to a great extent, the character of the blades. In some grasses the blades are flat and expanded while in others they are folded and rolled in various ways. When the leaf is rolled from one margin toward the other, it is called "convolute"; when both margins are rolled inward toward the center, it is called "revolute." "Conduplicate" is a term applied to leaves which are folded lengthwise so that the two halves of the upper surface come together.

Auricles.

In some grasses (Tribe *Hordeae*) the blade extends downward on each side at the junction of the blade and the sheath. These two lobes are called "auricles."

Scales and Bracts.

"Scales" and "bracts" are reduced leaves, the former found at the base of the culm below the foliage leaves and on the rhizomes; the latter appearing above the foliage leaves near the inflorescence and in the spikelets. The function of the scales appears to be that of protection. This is particularly noticeable at the growing end of a rhizome where the scales are crowded together and rolled up in the form of a hard, pointed bud which enables the rhizome to pierce the

hard soil without being injured. As the rhizome elongates, these scales become separated behind the growing tip. Some of the foliage leaves at the base of the inflorescence may become reduced in which case they are called "bracts." Bracts are also found at the base of the spikelets. These bracts will be discussed under the subject "inflorescence."

Inflorescence.

The flowers of grasses usually are grouped at the end of the culm or at the end of a branch arising in the axil of a leaf. The common forms of inflorescence are the spike, the raceme, and the panicle. If the inflorescence of such a grass as our common bluegrass is closely observed, it will be found to consist of small compact groups of flowers which easily may be mistaken for a single flower. These small groups of flowers are called "spikelets." The slender stem which joins the spikelet to the main axis of the inflorescence is called the "pedicel."

Spike.

When the spikelets have no pedicels and are sessile on the main axis, the inflorescence is called a "spike." Examples of spiked inflorescence are found in our common cultivated wheat and rye.

Raceme.

When the spikelets are joined to the main axis by a pedicel, the inflorescence is a "raceme." Sometimes the pedicel is very short, making the raceme look like a spike. This is true in our common crab grass but can be detected only by close observation.

Panicle.

When the spikelets are pediceled and joined to a branch of the main axis instead of being joined directly to the main axis, the inflorescence is called a "panicle." Examples of paniced inflorescence are found in our common cultivated oats and in bluegrass. When the branches are very short a compact spike-like panicle is formed such as that in our common timothy.

Unisexual Flowers.

The spikelets of grasses usually are perfect, that is, they contain both stamens and pistils. In some grasses the spikelets are unisexual, that is, they contain only stamens or only pistils. When these unisexual spikelets are found on different plants the grass is called "dioecious." This occurs only rarely. If the staminate spikelet and the pistillate spikelet are found on the same plant, but in different inflorescences, or in different parts of the same inflorescence, the plant is called "monoecious." An example of monoecious grass is found in corn; the staminate spikelets appearing in the tassel at the top of the stem and the pistillate spikelets appearing farther down on the stem where the ear is formed. In some grasses unisexual

spikelets and perfect spikelets may occur in the same inflorescence. An example of such a combination is found in *Andropogon furcatus*. Spikelets in some grasses may lack both stamens and pistils in which case they are called "neuter," such spikelets are found in some species of *Andropogon*. In a few grasses, as *Arrhenatherum* and *Notholeus*, the spikelet contains one perfect and one staminate flower.

Rachis and Rachilla.

The main axis of the inflorescence or any of the branches of the inflorescence to which the spikelets are attached is called the "rachis." The rachis is found to consist of many different forms; it may be continuous or jointed, round or flattened, straight or zigzag, or unsymmetrically developed so as to make the spikelets all located on one side. In some grasses the flattened rachis, particularly the zigzag type, is concave on the side on which the spikelet is attached, the spikelet fitting into this concavity. The small axis of the spikelet to which the florets are attached is called the "rachilla." The rachilla continuing below the spikelet and forming a stem by which the spikelet is attached to the axis is called the "pedicel." When the pedicel is absent, the spikelet is said to be "sessile." The rachilla may be jointed to the pedicel below the glumes of the spikelet. At maturity it breaks off at the joint carrying with it the glumes. In some grasses the rachilla is jointed to the pedicel above the glumes. When the spikelet breaks away, it leaves the glumes attached to the pedicel. These two forms of the jointing of the rachilla to the pedicel are very useful in identifying grasses.

Spikelet.

[Fig. 2.]



[Fig. 3.]



[Fig. 4.]



Fig. 2. Diagram of spikelet and floret. A. Spikelet; B. Floret; a. lower glume, b. upper glume, d. lemma, e. awn, f. palea, h. stamen, i. ovary, k. stigma, o. lodicule.

Fig. 3. Diagram of spikelet. a-a. rachilla, b. lower glume, c. upper glume, d. lemma, e. palea, f. lodicule, g. axis of flower, h. stamen, k. pistil.

Fig. 4. Diagram of cross section of floret. a. axis, d. lemma, e. palea, f. lodicule, h. stamen, k. pistil.

The "spikelet" of grasses is a very important factor for the purposes of classification. Its structure, therefore, must be thoroughly understood. It consists of two glumes at the base and one or more florets attached to the rachilla. The spikelets vary greatly with reference to the number and kind of florets contained. When it contains only one floret, this is usually terminal or located on the end of the rachilla. When it contains more than one floret, they are lateral with the exception of the uppermost one, which may be either lateral or terminal. Often the rachilla extends beyond the uppermost floret, having the form and appearance of a bristle. The florets may all be "perfect," that is, containing both stamens and pistils or some of the florets may be perfect and others imperfect, containing only stamens or only pistils; or some of the florets may be neutral, containing neither stamens nor pistil. These modifications will be noted in the keys or in the descriptions of genera and species. The typical spikelet consists of two glumes at the base. Above these glumes are lemmas alternately arranged with a palea and a flower in the axil of each lemma. The flower consists of two lodicules, three stamens and a pistil with two styles and two feathery stigmas.

Glumes.

The typical spikelet of grasses, as shown in figure 3, has two bracts at the base. These bracts which are reduced leaves, are called "glumes" or empty glumes because they bear no flower in the axils. The lower one is called the "first glume" and the upper, the "second glume." The first glume often is smaller than is the second and usually differs from it in nervation, texture and shape. The first glume is sometimes very small and in certain grasses is absent. In a very few grasses both glumes are absent.

Lemma.

Above the second glume is another bract called the "lemma." This bract likewise is a reduced leaf, as are the glumes, but instead of being empty it contains a flower in its axil. The lemma resembles the empty glumes, usually being green in color and containing nerves, the middle one of which is called the "keel." The keel often extends beyond the tip of the lemma, as also is true of the mid-nerve of the glumes. This bristle-like extension is called an "awn." The lemmas of grasses differ very much in different grasses. Probably no other organ of the grass flower undergoes so many modifications as does the lemma. In some it is hardened (indurated); in others it is thin and hyaline, while in others it may assume the forms of bristles.

Callus.

In some grasses the hardened and somewhat rounded lemma extends downward on the rachilla in the form of raised line or sharp

point which is called the "callus." Since the lemma undergoes so many modifications and takes on different forms, it may be difficult to determine, unless it is remembered that its position on the rachilla is that of the first organ above the two empty glumes.

Awns.

The nerves, particularly the mid-nerve, of the lemma and sometimes of the glumes, are often prolonged beyond the apex into bristle-like appendages called "awns." Sometimes the lemma has two teeth at its apex with the awn between them, occasionally these teeth may each bear an awn. In some grasses the awn originates below the apex of the lemma in which case is said to be "dorsal." When the awn is dorsal, the lemma has no mid-nerve above the point where the awn begins. The awns vary greatly in length, form and structure. They may be divided, branched, bent, hooked, scabrous or plumose. In some genera the awn may be jointed at the base, causing it to drop early. In some grasses the awns are twisted, particularly when they are dry. These twisted awns are usually sensitive to moisture and may be seen to untwist when placed in water.

Morphologically the awn is thought by some botanist, Haeckel for instance, to be homologous to the blade of the leaf; the lemma or the glume being homologous to the sheath. When the awn is dorsal, the portion of the lemma above the origin of the awn is probably homologous to the ligule.

Palea.

The lemma contains, in the typical spikelet, a flower in its axil, and for this reason some authors have called it the fertile glume. Between the flower and the rachilla is another bract called the "palea." The palea is usually thin and contains two nerves. It is usually concave, with the concave side toward the rachilla, and with the two edges folded or curved toward or around the flower. If the flower is considered a branch of the rachilla, then the palea corresponds to the prophyllum previously discussed. The palea, as was said of the lemma, may be greatly modified. In some grasses the palea may be a very small nerveless scale or may be absent as is the case in some species of *Agrostis*.

Lodicules.

The glumes, the lemma and the palea are really not parts of the flower. They are considered by most botanists to be homologous with leaves. The organs which are thought to be homologous with the perianth (sepals and petals) of common flowers are two very small scales called "lodicules" found at the base of the flower outside the stamens, located in front of the lemma. In some grasses a third

lodicule is found in front of the palea. It is these lodicules which swell up at anthesis and cause the floret to open. After fertilization they again become flaccid, thus allowing the floret to close.

Stamens.

In the typical grass flower are three stamens, one in front of the lemma and one at each edge of the palea. In many of the bamboos there is another whorl of three stamens inside of the first, making six stamens in all. The number of stamens is not uniformly three or six. They may vary from one in some genera to more than six in other genera. The anthers usually are large and two-celled, the two cells being separated below with the filament attached between them making them appear versatile.

Pistil.

There is one pistil with usually two styles and two plumose stigmas. Occasionally only one style is found and in some of the bamboos there are three. The styles may be wanting in some grasses when the stigma is said to be sessile, or the style may be very long and slender as is found in corn which causes the stigmas to protrude from the bracts or husk enveloping the ear. The ovary is one-celled and contains a single ovule, the ovule being closely connected with the ovary wall. Haeckel thinks that the ovary is composed of only one carpel. Walker¹ thinks that it contains three carpels.

Fruit.²

The fruit of grasses is usually a "caryopsis," commonly called a grain. Other forms of fruit, such as pods, berries and nuts, may be found in some grasses. The seed coat adheres to the ovary wall from which the seed does not separate. The caryopsis occasionally is united with the palea and very rarely also with the lemma. In some grasses the lemma and palea enclose the caryopsis but are not grown fast to it.

USES OF GRASSES

By consulting statistics taken from the U. S. Government reports it will be noticed that about 75% of the total value of all farm crops is derived from members of the grass family. These include such products as cereals, grass seed, hay and forage, broom corn, sorghum, sugar-cane, and pasturage. From the foregoing it will be seen that no other family of plants has such great agricultural value as does the grass family. The cereals are the principal food plants of the

¹See Walker on "The Structure of the Pistil of Some Grasses," Univ. Neb. Studies 6: No. 3, 1906.

²For a complete discussion of caryopsis of grasses see Kennedy, "The Structure of the Caryopsis of Grasses with Reference to Their Morphology and Classification," Bull. 19 (Div. Agrost. 47), U.S. Dept. Agric., 1899.

world. They include corn, wheat, oats, barley, rye, rice, kafir, milo, emmer and spelt, all of which belong to the grass family. The important products of sugar, starch, cellulose, and alcohol are made to a great extent from different species of grasses. Some of our important hay and forage plants such as clover, alfalfa, vetches, cowpeas, and soy beans do not belong to the grasses. This is true also of buckwheat.

In addition to the agricultural uses mentioned, certain species of grasses are employed in many other ways. Some are used for making paper and cordage; and a most important textile grass, "esparto" is grown chiefly in Spain and Africa. Great quantities of oil, syrup, starch, and alcohol are made from corn; much commercial vinegar is produced from malt liquor, the alcohol being converted into acetic acid by means of ferments. The large perennial grasses known as bamboos are used for building houses, and fences; also in making furniture, mats, screens, and many other useful articles. Straw hats are made chiefly from the straw or culms of grasses.

Grasses are very useful for fixing or binding the sand of shifting sand dunes and levees. Such a grass is one that will grow in sand and that possesses long creeping rootstocks. The best sand-binder is beach-grass (*Ammophila breviligulata*) which is found along the Atlantic coast of North America as far south as North Carolina.

Grasses are the chief plants forming the sod of our lawns and parks. There are also many grasses used for ornamental purposes. These are used on account of their beautiful plumes, graceful stems and leaves. Some of the smaller grasses are used for bouquets.

More of our wild grasses might well be used for ornamental purposes, and many of them such as *Sorghastrum nutans*, *Andropogon furcatus*, *Andropogon scoparius*, and *Panicum virgatum* are very beautiful.

The hard, ovoid, white, or bluish colored fruits of Job's-tears (*Coix Lacryma-jobi* L.) cultivated for ornamental purposes and escaped as a weed in the tropics, are used for making beads. The cobs of Indian corn are used for making pipes and also as fuel.

Some of the grasses with long culms as our cultivated rye are used for thatching roofs. Grasses which form strong stolons and therefore firm sods were used by the pioneers for making sod-houses. Such a grass is the buffalo grass of the Great Plains.

Broom corn, a variety of sorghum, is used extensively for making brooms and brushes.

DISTRIBUTION OF GRASSES

Grasses which include about 400 genera and nearly 5000 species are found in all parts of the world. They extend from the equator to the line of perpetual snow in the Arctic and Antarctic Continents and

from sea-level to the snow-cap of the highest mountains. They are found in the deep alluvial soil of river valleys, in the crevices of rocky cliffs, in swamps and deserts, in the dense shade of forests and most abundantly in open sunny prairies. Grasses as well as other plants are affected by ecological conditions such as temperature, moisture, soil fertility and other conditions, with the result that some tribes such as Andropogoneae and Paniceae predominate in the warmer regions of the earth, while such tribes as Agrostideae and Festuceae predominate in the cooler regions. Some genera such as *Andropogon*, *Panicum*, *Paspalum* and *Eragrostis* are found throughout the tropical regions of both hemispheres, while other genera as *Muhlenbergia* and *Bouteloua* are found chiefly in the American continent. *Poa* and *Festuca* which are found most abundantly in the cooler regions, are distributed over almost the whole earth from the northern to the southern limits of vegetation.



DESCRIPTIVE LIST OF SPECIES

[INCLUDING KEYS, ILLUSTRATIONS, DISTRIBUTION
AND
NOTES ON THE ECONOMIC IMPORTANCE]



KEY TO THE TRIBES

- A. *Spikelets 1-flowered* or if 2-flowered, the lower sterile or staminate, usually represented by a sterile lemma only; *spikelets articulated below the glumes*, more or less *dorsally flattened*, falling away entire, singly or along with the joints of a disarticulating rachis or with a subtending involucre.
- Glumes indurated or at least much firmer than the thin hyaline lemma and palea; spikelets falling away with the joints of the rachis.
- Spikelets unisexual, the pistillate below, the staminate above in the same inflorescence or in separate inflorescences. I. *Maydeae*.
- Spikelets in pairs, one sessile and perfect; the other pedicelled, perfect, staminate or empty, sometimes reduced to a single scale or wanting. II. *Andropogoneae*.
- Glumes membranaceous; fertile lemma and palea indurated; rachis not dis-jointing and falling away with the spikelets; (spikelets inclosed in a persistent bur in *Cenchrus*); first glume sometimes wanting; second glume and sterile lemma simulating a pair of glumes. III. *Panicæe*.
- Glumes none (except in staminate spikelet of *Zizania*), spikelets laterally flattened. IV. *Oryzeae*.
- AA. *Spikelets many-1-flowered*, if 1-flowered no sterile lemma below (2 sterile lemmas below in *Phalarideae*); *spikelets articulated above the glumes* (below in *Alopecurus*, *Polypogon*, *Notholeus*, *Spartina*, *Sphenopholis*, *Cinna*) which are persistent; spikelets more or less *laterally flattened*.
- Culms herbaceous, annuals.
- Spikelets 1-flowered (sometimes with sterile lemmas below the perfect flower), always in panicles or racemes, *not in rows*.
- Spikelets with a pair of sterile lemmas (scarcely visible scales in *Phalaris*) below the perfect floret and deciduous with it. V. *Phalarideae*.
- Spikelets with no sterile lemmas below the perfect floret (see *Arrhenatherum* Tribe VII and *Uniola* Tribe IX). VI. *Agrostideae*.
- Spikelets 1-several-flowered, *in rows*, forming equilateral or 1-sided spikes or racemes.
- Spikelets sessile in 2 opposite rows, forming equilateral spikes. X. *Hordeae*.
- Spikelets sessile in 2 rows on one side of a flattened axis, forming one-sided spikes, these digitate, paniculate or sometimes solitary. VIII. *Chlorideae*.
- Spikelets 2-many-flowered (see *Arrhenatherum* Tribe VII); in panicles, spike-like panicles or racemes.
- Lemmas equal to or longer than the glumes, unawned or awned with a straight awn from the apex. IX. *Festuceae*.
- Lemmas usually shorter than the glumes (as long or a little longer in *Sphenopholis* and *Koeleria*), and generally bearing a bent awn from the back or from between the teeth of the bifid apex; callus and rachilla joints usually hairy. VII. *Aveneae*.
- Culms woody, perennials. XI. *Bambuseae*.

KEY TO GENERA.

TRIBE I. MAYDEAE

- Staminate and pistillate spikelets in separate inflorescences, former in a terminal tassel, the latter in the axil of the leaf 1. *Zea*.
- Staminate and pistillate spikelets in the same inflorescence, pistillate below, staminate above.
- Spikes short, pistillate portion inclosed in a bead-like bract. 2. *Coix*.
- Spikes long, pistillate spikelets imbedded in cavities of the jointed rachis. 3. *Tripsacum*.

TRIBE II. ANDROPOGONEAE

- Spikelets all alike, perfect.
- Rachis of the racemes not articulated, panicle axis short, panicle fan-shaped. 4. *Miscanthus*.
- Rachis articulated, panicle axis elongated, forming a much branched ovoid, woolly panicle 5. *Erianthus*.
- Spikelets of 2 kinds, one sessile and perfect, the other pedicellate, staminate, empty or reduced to a mere scale or pedicel.
- Spikelets in slender, solitary, or digitate racemes which are terminal or lateral. 6. *Andropogon*.

Spikelets in panicles which are terminal only.

Pedicellate spikelets wanting (only the hairy pedicels present); stem hollow. 7. *Sorghastrum*.

Pedicellate spikelets present; stems solid8. *Holcus*.

Note.—See Nazia of Tribe Zoysieae page 44.

TRIBE III. PANICEAE

Spikelets with an involucre of bristles or a prickly bur.

Involucre of 1-several bristles; inflorescence spike-like.9. *Chaetochloa*.

Involucre a globular prickly bur; inflorescence racemose.10. *Cenchrus*.

Spikelets without a subtending involucre.

Spikelets in true panicles11. *Panicum*.

Spikelets in *one-sided* racemes.

Fertile lemma chartaceous with flat hyaline margins12. *Syntherisma*.

Fertile lemma indurated, margins inrolled not hyaline.

Sterile lemma awned or strongly mucronate; spikelets crowded in one-sided branches of the panicle; both glumes present13. *Echinochloa*.

Sterile lemma awnless; spikelets plano-convex, on second branches of the inflorescence; first glume obsolete14. *Paspalum*.

TRIBE IV. ORYZEAE

Spikelets unisexual, pistillate awned and in the upper part, staminate in the lower part of the same inflorescence. Tall annual marsh grass15. *Zizania*.

Spikelets perfect, awnless. Low perennials16. *Homalocenchrus*.

TRIBE V. PHALARIDEAE

Sterile lemmas minute awnless hairy scales attached to the base of the floret; glumes keeled17. *Phalaris*.

Sterile lemmas 2-lobed and dorsally awned, longer than the floret; glumes not strongly keeled18. *Anthoxanthum*.

TRIBE VI. AGROSTIDEAE

Lemmas indurated at maturity, at least firmer than the glumes.

Lemmas awnless, their margins inrolled, no basal callus19. *Milium*.

Lemmas awned, their margins flat, spikelets with a basal callus.

Awn 3-branched20. *Aristida*.

Awn simple.

Lemma broad, awn straight and deciduous21. *Oryzopsis*.

Lemma narrow, awn twisted and persistent22. *Stipa*.

Lemmas membranaceous, not firmer than the glumes.

Lemmas with a terminal awn or awn pointed; tightly enclosing the grain.

Rachilla prolonged behind the palea; glumes minute; lemma 1 cm. long.

.....23. *Brachelytrum*.

Rachilla not prolonged behind the palea; glumes evident; lemma not over 3 mm. long24. *Muhlenbergia*.

Lemmas awnless or with a dorsal awn, loosely enclosing the grain.

Glumes strongly compressed-keeled; panicle dense, cylindric, spike-like.

Glumes awnless.

Lemma awned below the middle25. *Alopecurus*.

Lemma awnless26. *Helicochloa*.

Glumes awned.

Lemma awnless, glumes persistent27. *Phleum*.

Lemma short-awned, glumes falling with spikelet28. *Polypogon*.

Glumes not conspicuously compressed; panicle open or narrow but not cylindrical.

Lemmas 1-nerved, awnless29. *Sporobolus*.

Lemmas 3-5-nerved.

Panicle open; lemma often awned.

Florets plainly stalked above the glumes; stamen 1.30. *Cinna*.

Florets not stalked above the glumes; stamens 3.

Callus and the prolonged rachilla bearing long, silky hairs.

.....31. *Calamagrostis*.

Callus naked or with short hairs; rachilla not prolonged. 32. *Agrostis*.

Panicle narrow and contracted; lemma awnless33. *Ammophila*.

TRIBE VII. AVENEAE

Spikelets awnless (rarely short-awned in *Sphenopholis*).

Articulation below the glumes; glumes distinctly different in shape, the second widened above34. *Sphenopholis*.

Articulation above the glumes; glumes similar in shape35. *Koeleria*.

Spikelets awned.

Florets 2, one perfect, the other staminate.

Lower floret staminate, the awn twisted, geniculate, exserted.

36. *Arrhenatherum*.

Lower floret perfect, awnless; awn of upper floret hooked37. *Notholcus*.

Florets 2 or more, all alike except the reduced upper ones.

Awn arising from between the teeth of a bifid apex, flattened, twisted

38. *Danthonia*.

Awn dorsal, not flattened; lemma often bifid at apex.

Spikelets large, the glumes over 1 cm. long39. *Avena*.

Spikelets less than 1 cm. long.

Lemmas keeled, bidentate; awn arising from above the middle.

40. *Trisetum*.

Lemmas convex; awn from below the middle.

Rachilla prolonged behind the upper floret; lemmas truncate and erose-dentate at summit41. *Aira*.

Rachilla not prolonged; lemmas tapering into slender teeth. 42. *Aspris*.

TRIBE VIII. CHLORIDEAE

Spikelets strictly 1-flowered, no sterile lemmas. (Sometimes rudimentary one in *Capriola*).

Spikelets articulate below the glumes, spikes racemose43. *Spartina*.

Spikelets articulate above the glumes, spikes digitate44. *Capriola*.

Spikelets more than 1-flowered.

Two-several perfect florets in each spikelet, spikes digitate.

Spikes with rachis extended beyond the spikelets in a naked point; second glume and at least lowest lemma cuspidate45. *Dactyloctenium*.

Spikes with rachis not extended beyond the spikelets; glumes and lemmas not cuspidate46. *Eleusine*.

One perfect floret in each spikelet; spikes racemose47. *Bouteloua*.

TRIBE IX. FESTUCEAE

Rachilla clothed with silky hairs longer than the florets. Culms 2-4 m. high.... 48. *Phragmites*.

Rachilla naked or with hairs shorter than the florets. Culms rarely over 1.5 m. high.

Spikelets of two forms, sterile and fertile intermixed49. *Cynosurus*.

Spikelets all alike.

Lemmas prominently 3-nerved.

Lemmas villous on the nerves below, not cobwebby.

Palea inconspicuously ciliate-fringed; all three nerves usually excurrent.

50. *Triodia*.

Palea fringed; only the middle nerve excurrent51. *Triplasis*.

Lemmas glabrous52. *Eragrostis*.

Lemmas 5-nerved, the nerves sometimes obscure

Spikelets with 2 or more of the upper lemmas empty, broad, enfolding each other, often forming a club-shaped mass53. *Melica*.

Spikelets with upper florets not different from the lower in shape.

Sterile lemmas below the fertile ones, persistent with the glumes 1-4.

54. *Uniola*.

Sterile lemmas below the fertile ones, none.

Spikelets unisexual, plants dioecious55. *Distichlis*.

Spikelets perfect.

Spikelets in dense 1-sided clusters at the end of the long naked panicle branches56. *Dactylis*.

Spikelets not in dense 1-sided clusters.

Spikelets as broad as long, somewhat heart-shaped....57. *Briza*.

Spikelets much longer than broad, not heart-shaped.

Lemmas awnless, obtuse or sub-acute.

Nerves of lemmas usually very prominent, lemmas convex.

58. *Panicularia*.

Nerves of lemma not prominent.

Lemmas keeled, often cob-webby at base.....59. *Poa*.

Lemmas not keeled, nor cob-webby at base..60. *Puccinellia*.

Lemmas awned or sharp pointed.

Lemmas rounded on the back, awn if present, from the tip.. 61. *Festuca*.
 Lemmas keeled toward the summit, awn from between 2 minute
 teeth 62. *Bromus*.

TRIBE X. HORDEAE

Spikelets solitary at each node of the rachis.
 Spikelets 1-flowered sunken in hollows in the rachis.....63. *Pholiurus*.
 Spikelets 2-many-flowered.
 Spikelets with one edge to the rachis64. *Lolium*.
 Spikelets with sides to the rachis.
 Glumes 1-nerved, subulate, spikelets with 2 perfect flowers....65. *Secale*.
 Glumes 3-many-nerved.
 Glumes ovate, spikelets 2-6-flowered66. *Triticum*.
 Glumes lanceolate or linear, spikelets 3-many-flowered....67. *Agropyron*.
 Spikelets 2-6 at each node of the rachis; some of them may be reduced.
 Spikelets all alike, 2-many-flowered.
 Glumes usually as long as the florets, spikes mostly dense.....68. *Elymus*.
 Glumes small or none, spikes loose69. *Hystria*.
 Spikelets not all alike, 1 (rarely 2-3) flowered, in 3's at each joint, lateral
 pair pedicelled, usually abortive70. *Hordeum*.

1. ZEA L.

Indian Corn, Maize.

Tall coarse annual grasses with solid stem, broad flat leaves, prominent prop roots and a monoecious inflorescence, the staminate spikelets in a terminal panicle called the tassel, the pistillate spikelets on a thick spike called the ear surrounded by a husk, and situated on the side of the stem in the axil of a leaf; staminate and pistillate spikelets sometimes in the same panicle. The staminate spikelets are in pairs on the rachis, one sessile and the other pedicel, each 2-flowered, the glumes are firm and longer than the thin lemma and palea; the pistillate spikelets are in rows on a thickened axis called the cob, this spikelet consists of 2 glumes, a sterile lemma with a small palea and a fertile lemma and palea. These glumes, lemmas, and paleas form the chaff which remains on the cob after the removal of the grain. Each ovary, which forms the grain, has a long style all of which protruding at the end of the ear form the silk.

This genus is represented by one species (*Zea mays* L.) which is our common cultivated corn of which there are many varieties such as dent corn, pop corn, and sweet corn which are considered by some as distinct species.

Corn has been cultivated from prehistoric times. It is a most valuable grass being used for food for both man and animals. Many valuable products such as syrups, starch and oil are made from the grain and the stigmas of the styles are used in medicine.

2. COIX L.

Job's Tears.

Coarse branched annual grasses with broad flat leaves and a monoecious inflorescence consisting of long-peduncled spikes which are pistillate at the base and staminate at the top. The staminate spikelets are covered by a hard leaf-sheath which becomes bony and bead-like in fruit, the staminate spikelets project beyond this sheath; the pistillate portion contains 1 fertile spikelet and 1 or 2 sterile spikelets, the staminate spikelets are in pairs.

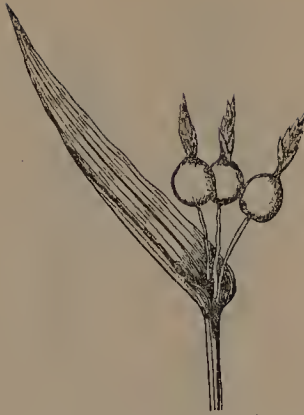


Fig. 5. *Coix lacryma-jobi* (Job's Tears).

COIX LACRYMA—JOBI L.

[Fig. 5.]

Job's Tears.

Culm 12-18 dm. (4-6 ft.) high; leaves broad; inflorescence of several monoecious spikes, each on a long peduncle, the pistillate part of the spike is enclosed in an urn-shaped, hard, shining bract at the base; the staminate part projects above this bead-like bract. The pistillate portion contains 1 fertile and 1 or 2 sterile spikelets; the staminate portion is several cm. long and consists of spikelets arranged in pairs, each floret bearing 3 stamens and no pistil. The mature fruit is contained in the hard, shining, ovoid, bluish bracts. These hard fruits are very attractive and are utilized as ornamental beads. The grass is cultivated both for the beads and as an ornamental plant. It occasionally escapes and may be found in waste places and near dwellings. In its native home, the tropics, it has escaped as a weed. The only known place in the state from which it has been reported is Philadelphia (Herb. Phila. Acad. Sc.).

3. TRIPSACUM L.

Gama Grass.

Tall stout monoecious perennials with solid stems, thick creeping rootstocks, broad flat leaves, and terminal and axillary spikes or racemes. Each spike bears staminate spikelets above and pistillate spikelets below, solitary, embedded in cavities of the rachis joints. This spikelet consists of a hard outer glume closing the spikelet in the cavity of the rachis, a thinner second glume, a sterile lemma with a palea, and a fertile floret. The staminate spikelets are in pairs on the slender upper part of the rachis; these spikelets each have two coriaceous glumes and two florets each with a hyaline lemma and palea. At maturity the staminate upper part of each spike falls away entire, while the pistillate part breaks away in separate joints each carrying with it the mature grain.

Only one species of this subtropical genus is found in Pennsylvania,

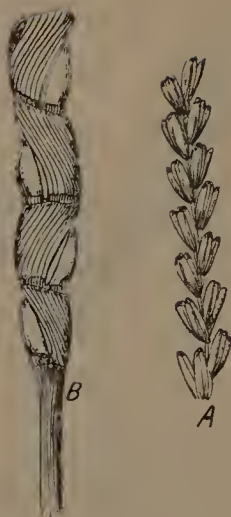


Fig. 6. *Tripsacum dactyloides* (Gama Grass). A. Staminate spikelets;
B. Pistillate spikelets.

TRIPSACUM DACTYLOIDES L.

[Fig. 6.]

Gama Grass.

Coix dactyloides L.

Tripsacum dactyloides var *monostachyum* Wood.

Culms 9-24 dm. high, solid; leaves 3 dm. or more long, 1.5-3.5 cm. wide, smooth; spikes 2-3 together at the summit, 10-20 cm. long; there are two kinds of spikelets in each spike; the pistillate borne singly and embedded in the rachis on the lower part of the spike, the staminate in pairs on the upper part of the spike; the cavity in which the pistillate spikelets is located is almost completely closed by the hardened outer glume which makes the lower part of the spike very different in appearance from the staminate upper part. July-August.

This grass is found in swamps or along streams from Rhode Island to Nebraska and south to Florida, Texas, and Mexico, and in the Bahamas, Haiti, and South America. It is a close relative of our common cultivated corn (*Zea mays* L.), and like it affords a large amount of forage. When young it is liked by all kinds of stock.

Distribution in Pennsylvania.

Berks, Chester: Flora of Phila. and vicinity. Delaware: Flora of Phila. and vicinity. Lancaster: July 5, 1904, Van Pelt; Sept. 1, 1909, South, Herb. Phila. Acad. Sc. Philadelphia: Flora of Phila. and vicinity.

4. MISCANTHUS Anderss.

Plume Grass.

Tall erect perennial grasses with flat leaves, and terminal, usually hairy panicles. Spikelets with one perfect flower, in pairs, unequally pedicellate; glumes membranous, blunt at the apex; sterile lemma thinner; fertile lemma hyaline, 2-toothed, awned from between the teeth; palea thin, hyaline; stamens three; stigmas plumose; grain free.



Fig. 7. *Miscanthus sinensis* (Japanese Plume Grass).

MISCANTHUS SINENSIS Anderss.

[Fig. 7.]

Eulalia, Chinese Plume Grass.

Japanese Plume Grass.

Eulalia japonica Trin.

Culms 1-3 m. high, with long slender leaves and a panicle of numerous erect or ascending branches: spikelets in pairs unequally pedicelled, 1-flowered, yellowish brown, surrounded at the base with long, white, or purplish hairs; glumes membranous, blunt apex: sterile lemma thin, fertile lemma thin, hyaline with a spirally twisted awn 8-10 mm. long arising from between the two teeth of the apex. Aug.-Oct.

This grass is a native of China, Japan, and the Celebes. It is cultivated for ornament and is found locally as an escape. A variety with banded or striped leaves is cultivated in the gardens and parks. This also occasionally escapes into waste places. There is a specimen of *Miscanthus sinensis* in the Herbarium of the Philadelphia Academy of Science, collected in Montgomery Co., Oct. 21, 1909, by Bayard Long.

5. ERIANTHUS Michx.

Woolly Beard Grass.

Tall robust perennial grasses, with long flat leaves, and terminal panicles clothed with long silky hairs, spikelets 2 at each node of the jointed rachis, each consisting of one (usually perfect) flower, the one sessile, the other pedicelled, each usually with a ring of hairs at the base; glumes nearly equal, somewhat hardened; sterile lemma hyaline, awnless; fertile lemma bearing an awn 1-2 cm. long; palea very small, nerveless; stamens 3; grain free, enclosed in the scales.

Awns flat and twisted at the base1. *E. divaricatus*.
Awns terete, not twisted at the base2. *E. saccharoides*.



Fig. 8. *Erianthus divaricatus* (Woolly Beard Grass).

1. **ERIANTHUS DIVARICATUS** (L.) Hitchc.

[Fig. 8.]

Woolly Beard Grass.

Andropogon divaricatus L.

Andropogon Alopecuroides L.

Erianthus Alopecuroides Ell.

Culms erect 1.5-3 m. high, nodes and portion below the inflorescence pubescent with upward-appressed, white hairs; sheaths smooth; blades 1.5-6 dm. long, 1.5-2.5 cm. wide, smooth, sometimes hairy near the base; panicles loose, silky; spikelets in pairs, one sessile, the other pedicelled, ring of hairs at base; glumes firm, about equal; sterile lemma hyaline, awnless, fertile lemma with a flattened spiral awn 1-2 cm. long. Sept.

This grass is found in moist soil from New Jersey to Oklahoma and southward to Florida and Texas.

Distribution in Pennsylvania.

Philadelphia: Herb. Phila. Acad. Sc., Martindale.



Fig. 9. *Erianthus saccharoides* (Plume Grass). A. Inflorescence; B. Pair of spikelets; C. Spikelet.

2. **ERIANTHUS SACCHAROIDES** Michx.

[Fig. 9.]

Plume Grass.

Erianthus compactus Nash.

Culms 1-3 m. high, erect; nodes and portion below the inflorescence villous with upward-appressed white hairs; sheaths smooth, densely pubescent with long hairs at the summit; blades 1.5-6 dm. long, 6-12 mm. wide, smooth or appressed pubes-

cent; panicle compact, pinkish, or tawny colored; spikelets in pairs, one sessile, the other pedicel, ring of hairs at base; glumes about equal, sterile lemma awnless, fertile lemma with a straight, round awn 1.5-2.5 cm. long. August-September.

This species is found in moist, sandy soil from New Jersey and Maryland southward. It may be distinguished from *E. divaricatus* by its round straight awn.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Herb. Phila. Acad. Sc. (Chester: Herb. Phila. Acad. Sc. 1908, Carter.

6. ANDROPOGON L.

Tall, usually tufted perennial grasses with narrow leaves and terminal and axillary racemes consisting of spike-like branches with long silky hairs on the rachis and pedicels. Spikelets in pairs at each node of the jointed rachis, one sessile and perfect, the other pedicellate and bearing stamens, empty, reduced to a scale or sometimes wanting; glumes of the sessile spikelet subequal, indurated, the outer one dorsally flattened with a strong nerve near each margin, the mid-nerve faint, the inner one keeled above; the sterile lemma empty, hyaline; the fertile lemma awned; palea hyaline, sometimes obsolete; grain free.

Racemes solitary on the few to many branches1. *A. scoparius*.
Racemes 2-several together, digitate or nearly so.

Pedicellate spikelet staminate, as large as the sessile spikelet, with glumes and lemmas2. *A. furcatus*.

Pedicellate spikelet reduced to the pedicel or 1 or 2 glumes.

Uppermost pair of racemes long-peduncled, their spathe inconspicuous, the lateral pairs short-peduncled from large inflated sheaths3. *A. ciliottii*.

Uppermost pair of racemes on peduncles not longer than those of the lateral ones, all the spathes about equally inflated.

Spathes scattered or in small clusters along the slender culm; spikelets about 3 mm. long4. *A. virginicus*.

Spathes aggregate in a dense fan-shaped or oblong compound inflorescence; spikelets about 4 mm. long.5. *A. glomeratus*.

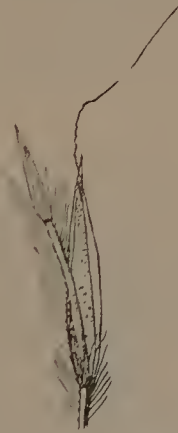


Fig. 10. *Andropogon scoparius* (Little Bluestem).

1. ANDROPOGON SCOPARIUS Michx.

[Fig. 10.]

Little Bluestem.

Schizachyrium scoparium Nash.

Hubbard, F. T., *Rhodora* 19: 100. 1917.

Roots fibrous; culms tufted, 4-12 dm. high; branches single or in pairs from the upper sheaths; sheaths convex to strongly flattened, glabrous or hairy; blade flat or plicate, midrib usually prominent below, glabrous or hairy above near the base; inflorescence open and elongated, slender; racemes slender, 2-6 cm. long, joints and sterile pedicels hairy on the margins; sterile spikelet a single awn-pointed glume 2-4 mm. long, fertile spikelet about 7 mm. long, terminated by a bent and twisted awn.

This grass is found on rather dry gravelly or sandy upland. It is common on the prairies and is a good forage plant if cut when young. Found from Maine to Montana, south to Florida, Texas, and New Mexico.

Distribution in Pennsylvania.

Allegheny: Homewood, Pittsburgh, Sept. 20, 1890, B. H. P. Berks: Sept. 21, 1878, T. J. Oberly. Bucks, Chester, Dauphin, Delaware: Porter's Flora. Erie: Presque Isle, Sept. 9-11, 1900, J. A. S. Fayette: Ohiopyle, Sept. 5, 1915, John Bright; Oct. 20, 1901. J. A. S.; Aug. 18, 1918, E. M. G. Fulton: Dane, Aug. 20, 1917, E. M. G. Lancaster, Luzerne, Northampton: Porter's Flora. Perry: New Bloomfield, Sept. 29, 1920, E. M. G. Somerset: Three miles west of Somerset, Aug. 22, 1876, B. H. P.; Giffen's meadows, Stoystown, Aug. 31, 1886, B. H. P.; Aug. 17, 1877, B. H. P. York: Frogtown, Sept. 11, 1921, E. M. G.

ANDROPOGON SCOPARIUS Michx.

Var. *frequens* Hubbard.

Var. *polyclados* Scribn. & Ball.

Var. *villosissimus* Kearney.

F. Tracy Hubbard (Rhodora 19: 100. June, 1917) in his investigation of *A. scoparius* in the U. S. and Canada has concluded that the species may be divided into three reasonably marked varieties as may be shown by the following key:

Glabrous sheath.

Open elongated paniclevar. *frequens* Hubbard.

Many branched, flabellate paniclevar. *polyclados* Scribn. & Ball.

Villous sheath.var. *villosissimus* Kearney.

According to Hubbard l. c. these varieties have all been found in Pennsylvania. The variety *frequens* is the common form of the species. Specimens of this variety are in the Herbarium of the Philadelphia Academy of Science from the following counties: Philadelphia, Northampton, Chester, Lehigh, and Montgomery. Variety *polyclados* has been collected from Chester, Delaware, Montgomery, and Philadelphia counties, from which places specimens are found in the Herbarium of the Philadelphia Academy of Science. Variety *villosissimus* has been collected from various stations (Hubbard l. c.) in Lehigh County by H. W. Pretz, also from Fern Hill, Chester County, September 7, 1908 by E. B. Bartram. These specimens are also of the Herbarium of the Philadelphia Academy of Science.



Fig. 11. *Andropogon furcatus* (Big Bluestem).
A. Inflorescence; B. Pair of spikelets.

2. ANDROPOGON FURCATUS Muhl.

[Fig. 11.]

Big Bluestem.

Culms 10-15 dm. high with 2-5 racemes terminal on the culm and its branches; culms smooth, round and branching from the upper nodes; sheath smooth; blades long (2-5 dm.), 4-8 mm. wide, scabrous on the margin and often hirsute on the upper surface near the base; racemes 5-12 cm. long, usually purplish; sessile spikelet 8-9 mm. long, terminated by an awn 10-14 mm. long, spirally twisted and usually bent; pediceled spikelet usually staminate, 6-7 mm. long. August-October.

This grass is found in sandy and alluvial soil along rivers and in spouty ground on higher situations. If cut when young it makes a good forage plant. Distributed from Maine to Sask. and southward.

Distribution in Pennsylvania.

Allegheny: Ohara Township, Six Mile Island, Aug. 8, 1898, S. N. Rhodes. Berks: Aug. 17, 1876, T. J. Oberly. Blair, Bucks, Centre, Chester, Dauphin, Delaware, Erie: Porter's Flora. Fayette: Ohio-pyle, Sept. 7, 1915, John Bright; Ohio-pyle, Aug. 18, 1918, E. M. G. Lancaster: Rawlinsville, 1886, Jas. Galen. Lebanon: Porter's Flora. Philadelphia: Hills along Tucan creek, July 17, 1903, Benj. H. Smith. Somerset: Stoystown, Aug. 9, 1874; Aug. 17, 1877; July 30, 1880, B. H. P. Westmoreland: On scant soil on top of residual blocks of rock at summit of Chestnut Ridge above Bears Cave, Hillside, Sept. 16-17, 1909, O. E. J. and Grace K. Jennings. York: Porter's Flora. Monroe: Delaware Water Gap, Aug. 3, 1920, E. M. G. and O. E. J. Northampton: Easton, Oct. 7, 1921, E. M. G. Fulton: Tuscarora Mts., Aug. 30, 1921, E. M. G.



Fig. 12. *Andropogon Elliottii* (Elliott's Beard Grass).

3. ANDROPOGON ELLIOTTII Chapm.

[Fig. 12.]

Elliott's Beard Grass.

Culm in tufts, 5-10 dm. high, branches bearded at the upper nodes; sheaths glabrous or loosely villous, upper ones aggregated and much enlarged; brilliantly colored in fall and winter; racemes usually 2, slender, flexuous, sometimes long-exserted, rachis joints and pedicels pubescent with long, silky hairs; sessile spikelet 3-4 mm. long, with an awn 10-20 mm. long; pedicellate spikelet reduced to a minute scale or wanting. Sept.-Oct.

Dry sandy or gravelly soil—New Jersey to Missouri, south to Florida and Texas.

Distribution in Pennsylvania.

Chester, Delaware, Montgomery, Philadelphia: Phila. Acad. of Sc.



Fig. 13. *Andropogon virginicus* (Broom-sedge).

4. ANDROPOGON VIRGINICUS L.

[Fig. 13.]

Broom-sedge.

Culms slender, 5-12 dm. high, sparingly branched above, smooth or sparsely pubescent; sheath smooth or somewhat hirsute or villous on the margin; blades usually hirsute on the margin and above near the base; racemes, 2 or 3, slender, inclosed in a prominent, smooth spathe brilliantly colored in fall and winter; hairs long and silky, usually light colored; pedicel spikelet reduced to a small scale, or only the pedicel present; sessile spikelet 3-4 mm. long with a very long straight awn. Aug.-Sept.

This grass grows in dry or moist open fields and hillsides. May be considered a weed, but it furnishes fair pasture early in the season. Bundles of stems tied together make good brooms, which are used in the southern states. From Massachusetts to Illinois and south to Florida and Texas.

Distribution in Pennsylvania.

Allegheny: In clumps, Cheswick, Nov. 27, 1916, E. W. Arthur. Bucks: North of Tullytown, Sept. 28, 1922, E. M. G. Chester: Porter's Flora. Delaware: Porter's Flora et al. Lancaster, Luzerne: Porter's Flora. Montgomery: Oct. 13, 1909, Bayard Long. Philadelphia: Porter et al.



Fig. 14. *Andropogon glomeratus* (Bushy Beard Grass).

5. ANDROPOGON GLOMERATUS (Walt.) BSP.

[Fig. 14.]

Bushy Beard Grass.

Andropogon macrourus Michx.

Andropogon corymbosus Nash.

Culms stout, erect, 5-15 dm. high; sheaths compressed, with a prominent midrib, scabrous, glabrous or pubescent; blades long; inflorescence bushy-branched at the top of the culm; racemes 2, protruding from the side or exerted from the apex of the scabrous spathes; rachis flexuous, joints and pedicel of the sterile spikelet pubescent with long silky hairs; sessile spikelet about 4 mm. long with an awn nearly 2 cm. long, sterile spikelet reduced to a scale or wanting. Sept.-Oct.

Damp, sandy soil near the coast. From Massachusetts south to Florida and Mississippi, southern California and Nevada.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Chester: Aug. 15, 1908, F. W. Pennell. Delaware: Tinicum, Sept. 6, 1906, Witmer Stone, et al. Lancaster: Porter's Flora. Montgomery: Porter's Flora.

7. SORGHASTRUM Nash.

Indian Grass.

Tall stout perennial grasses, with long narrow flat leaves and large open panicles. Spikelets sessile at each joint of the rachis, the pedicellate spikelet in our species reduced to hairy pedicles; glumes of the sessile spikelet indurated, shining; sterile lemma hyaline; fertile lemma small, hyaline, with a strong awn; palea sometimes wanting.



Fig. 15. *Sorghastrum nutans* (Indian Grass). A. Inflorescence; B. Spikelet with two hairy pedicels of reduced spikelets.

SORGHASTRUM NUTANS (L.) Nash.

[Fig. 15.]

Indian Grass.

Andropogon nutans L.*Andropogon avenaceum* Michx.*Chrysopogon avenaceus* Benth.*Sorghastrum avenaceum* (Michx.) Nash. (Porter's Flora).

Culms from long, creeping rootstock, erect, 1-2 m. high, smooth, nodes covered with appressed hairs; sheaths glabrous or the lower ones pubescent; blades long, 6-12 mm. wide, scabrous, glaucous; panicle 1-3 dm. long, narrow, open at first, contracted after flowering; spikelets 6-8 mm. long, yellowish or brownish, covered especially toward the base with fawn colored hairs; awn twisted, 10-20 mm. long. August-September.

This is one of the grasses of the original prairies and is one of the chief constituents of hay in that region. It is found on dry

soils from Maine to Manitoba and southward. In Pennsylvania it is found forming large tussocks on the dry sandy soils along rivers. When in bloom it is one of our most beautiful grasses.

Distribution in Pennsylvania.

Allegheny: Near Moon Run Station, P. & L. E. R. R., Sept. 11, 1886, B. H. P.; Six Mile Island, Ohara Twp., Aug. 9, 1898, S. N. Rhodes. Bucks, Chester, Dauphin, Delaware: Porter's Flora. Erie: Presque Isle, Aug. 1879, Guttenberg; Presque Isle, Aug. 24-26, 1905, O. E. J. Fayette: Ohionyle, Aug. 18, 1918, E. M. G.: Sept. 6, 1915, John Bright; Sept. 1, 1901, J. A. S. Huntingdon: Porter's Flora. Lancaster: 1884, Jas. Galen. Luzerne: 1884, Jas. Galen. Northampton: On Delaware above Easton, Aug. 15, 1899, Porter; Sept. 5, 1849, Dr. F. Greene. Perry: Alinda, Sept. 29, 1920, E. M. G. Philadelphia: Porter's Flora. Somerset: Aug. 1875, B. H. P. York: Porter's Flora.

8. HOLCUS L.

Sorghum Pers.

Tall, stout, annual or perennial grass with solid stem, flat leaves and large open panicle. Spikelets in pairs at the nodes, or in 3's at the ends of the branches, one sessile and perfect, the other pedicellate and staminate or empty; glumes indurated, shining, obscurely nerved; sterile lemma hyaline; fertile lemma hyaline, awned; palea small or sometimes absent; grain free.

One species, *H. halepensis*, the well known Johnson-grass of the south, is a valuable forage grass and is found as an escape from cultivation. Another important species (*H. sorghum* L.) is cultivated in many forms for fodder, grain syrup, and broom-corn under various names as sorghum, durra, Kafir-corn, broom-corn, feterita, milo, etc.



Fig. 16. *Holcus halepensis* (Johnson Grass). A. Inflorescence; B. Three spikelets; a. Fertile, sessile spikelet, b. Pedicelled, sterile spikelet; C. Reverse side of B; D. Rootstock.

HOLCUS HALEPENSIS L.

[Fig. 16.]

Johnson Grass.
Andropogon halepensis Brot.
Sorghum halepense Pers.

Culms 10-15 dm. high, erect, smooth, spreading by strong creeping rhizomes; sheath smooth; ligule 2 mm. long, upper half fringed; blade smooth or nearly so, 3-6 dm. long, 6-12 mm. wide, white midrib conspicuous; panicles 15-60 cm. long, wide and spreading, more or less reddish or purplish, branches 2-4 in a whorl, pubescent in the axis; spikelets in 2's or 3's, one sessile and perfect, the other one or two pedicelled and sterile, fertile spikelet about 5 mm. long, pubescent at first but becoming smooth later, sterile spikelet more slender and slightly longer, pedicels about $\frac{1}{2}$ as long as the fertile spikelet, sterile spikelets break off easily leaving the fertile spikelet and the pedicels; awn of the fertile spikelet, 10-16 mm. long, readily broken off. July-Sept.

This grass is a native of southern Europe and Asia. It has escaped from cultivation and is found in waste places in New Jersey and Pennsylvania southward. It is a valuable forage grass, but on account of its tendency to spread and the difficulty in its eradication, its use is not to be recommended. In parts of the South, where it is known as Johnson grass, it has become a very troublesome weed. It is rare in Pennsylvania having been reported only from Bucks Co., and Philadelphia by Porter (Porter's Flora). Probably only a transient in the state. For detailed information on this grass, see Ball, C. R., Johnson Grass. U. S. Dept. of Agr. Bur. Plant Ind. Bull. 11. 1902.

NAZIA RACEMOSA (L.) Kuntze.

Prickle Grass.

[Note: Belongs to Tribe Zoysieae.]

An annual grass with one-flowered deciduous spikelets which are solitary or in clusters of 3-5 in terminal spikes. Culms 5-35 cm. tall, smooth below, pubescent above; sheaths smooth and glabrous; blades 2.5-7.5 cm. long, ciliate; spikelets 1-flowered; first glume very small, second about 3 mm. long, 5-nerved, each nerve bearing a row of hooked prickles.

This species which is found in the tropical regions of both hemispheres has been introduced into southern U. S. It extends from Texas to Arizona and is sometimes found on ballast and in waste places about the Atlantic seaports. It has been found on ballast in Philadelphia; but as it is a southern plant it may not be found again in the state.

9. *CHAETECHLOA* Scribn.*Setaria* Beauv.

Annual or perennial grasses with flat leaf-blades, and spike-like panicles. The structure of the spikelet is the same as that of *Panicum* but each spikelet is surrounded by few or many persistent awn-like bristles which are borne on the branchlet below the articulation of the spikelet.

Plants perennial from short knotty rootstocks1. *C. geniculata*.
Plants annual, no rootstocks.

Bristles downwardly barbed.2. *C. verticillata*.
Bristles upwardly barbed.

Bristles 5 or more in each cluster; spikes yellowish.3. *C. lutescens*.
Bristle 1-3 in each cluster; spike green or purplish.

Spikelets articulate below the glumes, the whole spikelet falling off.4. *C. viridis*.
Spikelets articulate above the glumes, only the fruit falling off, leaving the glumes and sterile lemma.5. *C. italica*.



Fig. 17. *Chaetochloa geniculata* (Perennial Foxtail).
A. Spikelet; B. Reverse side of A.

1. *CHAETECHLOA GENICULATA* (Lam.) Millsp. & Chase.

[Fig. 17.]

Perennial Foxtail.

Chaetochloa Imberbis (Poir.) Scribn.*Setaria Imberbis* R. & S.

Hitchcock and Standley, Flora of the District of Columbia and Vicinity. Cont. U. S. Nat. Herb. 21: 1919.

A perennial from a short knotty rootstock; culms single or somewhat tufted 3-7 dm. high, often geniculate at the base; sheaths overlapping, compressed, glabrous; blades 1-3 dm. long, 3-7 mm. wide, glabrous or nearly so; spike (panicle) 2-5 cm. long, nearly 1 cm. wide, exclusive of the bristles; spikelets about 2 mm. long, often purple tipped; bristles 8-12, 5-10 mm. long, pale yellowish or purplish, upwardly barbed; first glume $\frac{1}{3}$ as long as the spikelet, second $\frac{1}{2}$ - $\frac{2}{3}$ as long, midnerve excurrent; sterile and fertile lemmas equal.

This species is similar in appearance to *C. lutescens* but can be distinguished by its knotty rootstock and shorter spikelet. Its bristles are green, pale yellow or purplish while those of *C. lutescens* are dark yellow. It is found in moist soil from Massachusetts to Kansas and southward.

Distribution in Pennsylvania.

Berks: Wet meadow on Nolde Estate near Reading, July 24, 1919, E. M. G. Chester: Near Chester, July 22, 1920, E. M. G. Delaware, Lehigh, Montgomery, Philadelphia: Herb. Phila. Acad. Sc. York: Frogtown, Summer, 1921, E. M. G.



Fig. 18. *Chaetochloa verticillata* (Foxtail). A. Inflorescence; B. Downwardly barbed bristle; C. Portion of bristle magnified.

2. CHAETOCHLOA VERTICILLATA (L.) Scribn.

[Fig. 18.]

Foxtail.

Setaria verticillata (L.) Beauv.

A tufted annual; culms 3-6 dm. high, erect or spreading; sheaths smooth; blades 5-20 cm. long, scabrous on the upper surface; spikes (panicles) 5-10 cm. long, green, more or less interrupted at the base; spikelets 2-2.5 mm. long; bristles 1-3 downwardly barbed, 3-6 mm. long; first glume $\frac{1}{3}$ as long as the second which equals the sterile lemma and slightly exceeds the fertile lemma. July-September.

This species is found about dwellings and in waste places from Nova Scotia to Ontario and south to New Jersey, Missouri and Nebraska. Not so common in the state as *C. viridis* and *C. lutescens*.

Distribution in Pennsylvania.

Allegheny: Edgewood, July 19, 1918, E. M. G.; Sharpsburg. Sept. 20, 1885, B. H. P. Bucks, Chester: Porter's Flora. Lancaster: Flora of Phila. and vicinity. Northampton: College Hill, Easton, Oct. 1868, A. P. Garber (Porter). Philadelphia: Porter's Flora.

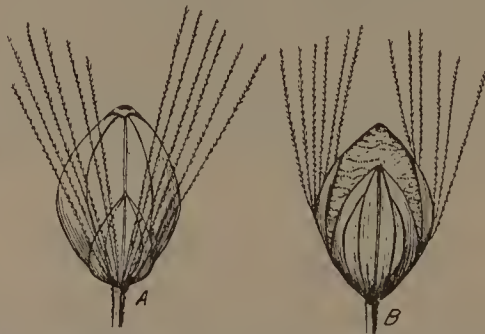


Fig. 19. *Chaetochloa lutescens* (Yellow Foxtail). A. Spikelet; B. Reverse side of A.

3. CHAETOCHLOA LUTESCENS (Weigel) Stuntz.

[Fig. 19.]

Yellow Foxtail.

Hubbard, Rhodora 18: 232. Nov. 1916.

[NOTE.—This grass has commonly been called *Setaria glauca* and *Chaetochloa glauca*.]

An annual; culms branching at the base, erect or sometimes decumbent, 3-12 dm. high; sheaths smooth; blades 5-15 cm. long, 4-8 mm. wide, smooth; spikes (panicles) 2-10 cm. long; spikelet about 3 mm. long; bristles 5 or more, tawny yellow, upwardly barbed; first glume $1\frac{1}{2}$, second $\frac{2}{3}$ as long as the fertile lemma. July-September.

This grass is found throughout North America except in the far north. It is one of our worst weeds in cornfields and other cultivated fields. In the cornfield it comes up after cultivation has been finished. By late fall it will seed, which insures a crop for the following year. As it is an annual thorough cultivation will eradicate it. Its distribution in Pennsylvania is so general that the places from which it has been reported, are not listed. Rare on the Pacific Coast.



Fig. 20. *Chaetochloa viridis* (Green Foxtail). A. Inflorescence; B. Spikelet; C. Reverse side of B; D. Bristles.

4. CHAETOCHLOA VIRIDIS (L.) Scribn.

[Fig. 20.]

Green Foxtail.

Setaria viridis (L.) Beauv.

A tufted annual; culms 2-9 dm. high, branching at the base, erect or spreading; sheaths glabrous; blades 5-25 cm. long, 4-10 mm. wide, scabrous above; spikes (panicles) 3-12 cm. long, about 1 cm. wide; spikelets about 2 mm. long; bristles 1-3, green or purplish, upwardly barbed, usually 7-12 mm. long; second glume and sterile lemma equal, covering the fertile lemma. July-September.

This species is found in waste places and cultivated grounds throughout North America except in the far north. It too is a weed but not so abundant as is the yellow foxtail. It can also be eradicated by thorough cultivation.

Distribution in Pennsylvania.

Allegheny: Common. Bucks, Chester, Delaware, Erie, Franklin, Lancaster, Northampton: Porter's Flora. Somerset: Stoystown, Aug. 24, 1885, B. H. P.



Fig. 21. *Chaetochloa italica* (Millet).

5. *CHAETOCHLOA ITALICA* (L.) Scribn.

[Fig. 21.]

Millet.

Setaria italica (L.) Beauv.

American Journal Botany 2: 183-196. 1915.

Rhodora 18: 232-233. 1916.

[Hitchcock, A. S., The Genera of Grasses of the U. S., U. S. Dept. of Agr. Bull. 772. 1920.]

An annual cultivated under the name of millet; culms 6-15 dm. high; sheaths smooth or scabrous; blades 15-30 cm. long, 6-36 mm. wide, generally scabrous; spikes (panicles) compound, interrupted below, 8-20 cm. long, 1.25-5 cm. thick, nodding, yellowish or purplish; bristles 2-3 upwardly barbed, equaling or exceeding the spikelets which are about 3 mm. long.

This species has been introduced from the Old World. It has escaped from cultivation and may be found in waste places from Quebec to Minnesota and south to Florida and Texas. In cultivation the spikes are robust but in the escaped state they may be small which makes the plant resemble *C. viridis* from which it may be distinguished by the fact that in *C. viridis* the spikelet is articulate below the glumes shelling out and leaving only the cup-like receptacle while in *C. italica* the spikelet is articulate above the glumes, therefore, shelling out and leaving the persistent glumes and sterile lemma attached to the receptacle. It has been reported as an escape from the following counties: Allegheny, Bucks, Chester, Luzerne, Lycoming, Northampton, and Philadelphia.

10. *CENCHRUS* L.

Sandbur.

Our species annual with spiny racemes terminating the culm and branches. Spikelets similar to those of *Panicum* but 2-6 together surrounded by a hard spiny, bur-like involucre which falls off with the spikelets at maturity. Glumes shorter than the lemmas, first hyaline, second membranous; sterile lemma with a thin hyaline palea which sometimes bears a staminate flower; lemma and palea of the fertile flower somewhat hardened but the lemma not inrolled on the margins as in *Panicum*; grain free, inclosed in the hardened lemma and palea and the prickly involucre.



Fig. 22. *Cenchrus pauciflorus* (Sandbur).

CENCHRUS PAUCIFLORUS Benth.

[Fig. 22.]

Sandbur.

Hitchcock and Chase, Revision of N. A. Grasses, Contributions U. S. Nat. Herb., 22: 1920.

[NOTE.—This grass has commonly been called *Cenchrus tribuloides* L. and *Cenchrus carolinianus* Walt.]

Grass with racemes of spiny burs at the end of the culm and branches; culms branched, erect at first but spreading or prostrate later, 3-8 dm. high; sheaths over-lapping, glabrous or sometimes ciliate along the margin and near the ligule; blades scabrous above, 5-12 cm. long and 4-8 mm. wide; racemes of about 8-20 involucre, which are about 5 mm. in diameter exclusive of the spines, pubescent with relatively short hairs; spines very sharp, about 4 mm. long; spikelets 2-3 in each involucre. June-September.

Sandy soil of river banks from Maine to Florida and westward across the continent. A weed.

Distribution in Pennsylvania.

Allegheny: Sandy river banks below Sharpsburg, Sept. 1, 1889, Dr. Ziegler. Bucks, Chester, Dauphin, Delaware: Porter's Flora. Erie: Presque Isle, Sept. 9-11, 1900, J. A. S.; Presque Isle, Aug. 25, 1905, O. E. J. Lancaster: Rawlinsville, 1886, Jas. Galen. Luzerne, Lycoming: Porter's Flora. Northampton: On the Delaware above Easton, sandy field, Aug. 1899, Porter. Philadelphia: Porter's Flora.

11. PANICUM L.

[See Fig. 52; A; B; C; D; E.]

Panic Grass.

[Hitchcock and Chase. N. A. Species of Panicum. Contributions U. S. Nat. Herb., 15. 1910.]

Annual or perennial grasses of various habit with the spikelets in panicles: spikelets with one perfect flower, rarely with a staminate flower below the perfect one; glumes very unequal, the first often very small, the second glume and sterile lemma are nearly equal and both usually strongly nerved, the sterile lemma often incloses a very thin hyaline palea and rarely a staminate flower; fertile lemma and palea both very hard, the margins of the lemma inrolled; grain free but firmly inclosed in the hard shining lemma and palea.

Key to the Species of *Panicum*.

- Plants annual. Panicles open.
 Spikelets warty. Plants glabrous1. *P. verrucosum*.
 Spikelets smooth.
 Sheaths glabrous; first glume only one-fourth as long as the spikelet, truncate2. *P. dichotomiflorum*.
 Sheaths hirsute; first glume as much as half the length of the spikelet, pointed.
 Panicles drooping; spikelets 4.5-5 mm. long3. *P. miliaceum*.
 Panicles erect; spikelets not over 3.5 mm. long.
 Spikelets 3-3.5 mm. long, acuminate; panicles narrow, usually less than half as broad as long, or sometimes spreading at maturity.4. *P. flexile*.
 Spikelets about 2 mm. long, acutish but not acuminate; panicles as broad as long.
 Panicles more than half the length of the entire plant; culms rather stout, erect or ascending5. *P. capillare*.
 Panicles not more than one-third the length of the entire plant; culms erect or decumbent-spreading.
 Culms stout, soon decumbent-spreading; blades about 1 cm. wide.5. *P. gattingeri*.
 Culms slender, erect, zigzag below; blades not over 6 mm. wide.7. *P. philadelphicum*.
- Plants perennial.
 Spikelets short-pedicelled, on short branchlets along the main branches of the panicle, pointed. Sheaths keeled.
 Rootstocks present; culms but little compressed8. *P. anceps*.
 Rootstocks wanting; culms strongly compressed, with keeled sheaths.
 Ligule ciliate, 2-3 mm. long; panicle much exceeding the upper leaves.9. *P. longifolium*.
 Ligule erose or lacerate but not ciliate; panicle not much longer than the upper leaves.
 Fruit stipitate; spikelets conspicuously secund; panicle usually purple.10. *P. stipitatum*.
 Fruit not stipitate; spikelets not conspicuously secund; panicle green or slightly tinged with purple.
 Spikelets 1.8-2 mm. long; panicle branches ascending or spreading.11. *P. agrostoides*.
 Spikelets about 2.5 mm. long; panicle branches erect or nearly so.12. *P. condensum*.
- Spikelets long-pedicelled.
 Panicle narrow, branches ascending13. *P. amarum*.
 Panicle open, branches spreading.
 Rootstocks present; culms stout and erect; no winter rosette of leaves formed.
 Spikelets 4-4.5 mm. long (rarely 3.5-5 mm.), beaked; first glume two-thirds the length of the spikelets or more.14. *P. virgatum*.
 Spikelets not over 3.2 mm. long, not beaked; first glume about half the length of the spikelet.15. *P. virgatum cubense*.
 Rootstocks wanting; plants usually forming a winter rosette of basal leaves, vernal phase blooming in the early summer, the culms simple, with open terminal panicles; the autumnal phase much branched, the panicles reduced and more or less included in the sheaths.
 Blades elongate, not over 5 mm. wide, 20 times as long as wide. (See *P. bicknellii* and *P. angustifolium*.)
 Spikelets about 3.5 mm. long, beaked16. *P. depauperatum*.
 Spikelets 2-2.7 mm. long, not beaked.
 Sheaths pilose17. *P. linearifolium*.
 Sheaths glabrous18. *P. werneri*.
 Blades not elongate, usually not more than 10 times as long as wide.
 Spikelets glabrous. (*P. microcarpon* and *dichotomum* rarely minutely pubescent)
 Spikelets about 1.5 mm. long. Nodes bearded; autumnal phase much branched, reclining19. *P. microcarpon*.
 Spikelets 2 mm. long or more.
 Culms soon prostrate, the autumnal phase vinelike.20. *P. lucidum*.
 Culms erect, the autumnal phase sometimes reclining but not vine-like.
 Spikelets about 2.5 mm. long, pointed beyond the fruit.21. *P. yadkinense*.
 Spikelets 2 mm. long, not pointed beyond the fruit.
 Nodes glabrous (may be slightly hairy); autumnal phase erect, branched liked a little tree22. *P. dichotomum*.
 Nodes, at least the lowest, bearded; autumnal phase top-heavy, reclining23. *P. barbulatum*.
 Spikelets pubescent (sparsely so in *P. scribnerianum*).

- Spikelets 3 mm. long or more. (sometimes less in *P. clandestinum*.)
 Nodes bearded; spikelets 4-4.5 mm. long.
 Blades glabrous or nearly so on both surfaces.24. *P. boscii*.
 Blades velvety beneath25. *P. boscii molle*.
 Nodes not bearded; spikelets mostly less than 4 mm. long.
 Blades 1.5-4 cm. wide, cordate-clasping.
 Sheaths glabrous; spikelet about 3.5 mm. long. 26. *P. latifolium*.
 Sheaths, at least the lower, tuberculate-hispid; spikelet about 3 mm. long.27. *P. clandestinum*.
 Blades not over 1.5 cm. wide (rarely wider in *xanthophysum*), not cordate clasping.
 Spikelets 3.5-4 mm. long; panicle very narrow, branches appressed.28. *P. xanthophysum*.
 Spikelets 3.2-3.3 mm. long; branches of panicle spreading.29. *P. scribnerianum*.
 Spikelets less than 3 mm. long (see *P. clandestinum*). A, AA.
 A. Ligule manifest, 2-5 mm. long (1-1.5 mm. long in *P. tsugctorum*)
 Sheaths glabrous or the lowest sometimes pubescent.
 Panicle narrow, one-fourth to one-third as wide as long.30. *P. spretum*.
 Panicle open, nearly as wide as long31. *P. lindheimeri*.
 Sheaths pubescent.
 Spikelets 2.2-2.4 mm. long32. *P. villosissimum*.
 Spikelets less than 2 mm. long.
 Vernal blades glabrous or nearly so on the upper surface.
 Ligule 1-1.5 mm. long; culm crisp-puberulent.33. *P. tsugctorum*.
 Ligule 4-5 mm. long; culm papillose-pilose or becoming glabrous.34. *P. tennesseense*.
 Vernal blades pubescent on the upper surface.
 Spikelets 1.3-1.5 mm. long; vernal blades long-pilose on the upper surface.
 Autumnal phase widely decumbent-spreading, forming a mat, the vernal culms soon geniculate-spreading; plants grayish olivaceous.35. *P. albemarlense*.
 Autumnal phase erect, not forming a mat; plants yellowish green.
 Axis of panicle pilose, panicle branches tangled, the lower ones drooping36. *P. implicatum*.
 Axis of panicle puberulent only, panicle branches not tangled, lower ones ascending37. *P. meridionale*.
 Spikelets 1.6-1.8 mm. long; vernal blades appressed-pubescent.
 Blades stiff, erect38. *P. huachucae*.
 Blades lax, spreading39. *P. huachucae silvicola*.
 AA. Ligule obsolete or less than 1 mm. long.
 Nodes bearded.
 Blades densely velvety pubescent40. *P. annulum*.
 Blades glabrous or only the lower pubescent.
 Spikelets 1.5-1.6 mm. long, glabrous, rarely pubescent19. *P. microcarpon*.
 Spikelets 2 mm. or more long41. *P. clutei*.
 Nodes not bearded.
 Plants densely gray-velvety throughout, a viscid glabrous ring below the nodes42. *P. scoparium*.
 Plants not gray-velvety.
 Sheaths, or some of them, pilose or hispid.
 Pubescence papillose-hispid27. *P. clandestinum*.
 Pubescence ascending-pilose.
 Spikelets 2.2-2.4 mm. long43. *P. commonsianum*.
 Spikelets 1.5 mm. long44. *P. columbianum*.
 Sheaths glabrous or only puberulent.
 Spikelets spheric at maturity, not over 1.8 mm. long; blades with a thin white cartilaginous margin.
 Culms spreading; panicle as broad as long45. *P. sphaerocarpon*.
 Culms erect; panicle two-thirds as broad as long. ..46. *P. polyanthes*.
 Spikelets not spheric.
 Spikelets 2.5 mm. long.
 Upper blades elongated, not cordate or rounded at base.
 Spikelet not papillose, culms glabrous.47. *P. bicknellii*.
 Spikelets rugose-papillose, culms pubescent, at least below.48. *P. angustifolium*.
 Upper blades not elongated, cordate or rounded at base.
 Blades rounded at base, not cordate.49. *P. boreale*.
 Blades cordate at base.
 Culms crisp-puberulent; blades usually less than 1 cm. wide.50. *P. ashei*.
 Culms glabrous; blades usually 1.2 cm. wide or more.51. *P. commutatum*.
 Spikelets less than 2 mm. long.
 Culms crisp-puberulent44. *P. columbianum*.



Fig. 23. *Panicum verrucosum* (Warty Panic Grass).

1. **PANICUM VERRUCOSUM** Muhl.

[Fig. 23.]

Warty Panic Grass.

Panicum debile Ell.

A branching annual, solitary, or few together; culms slender, 2 dm.-1.5 m. high; sheaths shorter than the internodes, smooth; blades thin, flat, 5-20 cm. long, 4-10 mm. wide, smooth; panicles 5-30 cm. long, about as wide, few flowered, very small panicles produced near the base; spikelets 1.8-2.1 mm. long; first glume about $\frac{1}{4}$ as long as the spikelet; second glume and sterile lemma distinctly warty. July-September.

Found in moist soil from Massachusetts to Florida and Texas, also in Indiana and Tennessee, mostly near the coast. This species is easily distinguished by its warty spikelets.

Distribution in Pennsylvania.

Bucks: Tullytown, Aug. 28, 1922, E. M. G.; Bristol, Porter's Flora. Delaware: Tinicum, Sept. 12, 1900, B. H. Smith.

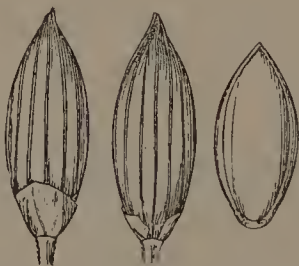


Fig. 24. *Panicum dichotomiflorum* (Spreading Witch Grass).

2. **PANICUM DICHOTOMIFLORUM** Michx.

[Fig. 24.]

Spreading Witch Grass.

Panicum proliferum [Amer. Authors.]

Panicum geniculatum Muhl.

An annual; culms branched, somewhat flattened, geniculate at the nodes, 5-10 dm. high; sheaths smooth, loose; blades 10-50 cm. long, 3-20 mm. wide, scabrous on margin and sometimes on the nerves, white midnerve prominent underneath; panicle terminal and axillary, usually included in sheath, many flowered, 1-4 dm. long; spikelets short-pedicled, mostly secund toward the ends of the branches, 2-3.2 mm. long, acute, often greenish purple; first glume about $\frac{1}{5}$ as long as the spikelet, second glume and sterile lemma pointed beyond the fruit. July-October.

This species is found in low waste ground also in cultivated fields, where it is often found growing abundantly in autumn after the crop has matured. In such situations it must be considered a weed but as it is an annual thorough cultivation will easily exterminate it. Distributed from Maine to Nebraska and southward to Florida and Texas. It is also found in California and Mexico, the West Indies and South America.

Distribution in Pennsylvania.

Allegheny: Edgewood, Sept. 1, 1917, E. M. G.; Pittsburgh, Sept. 15, 1904, O. E. J.; Glenshaw, Oct. 10, 1918, O. E. J. Chester, Dauphin: Porter's Flora. Delaware: Chester, July 22, 1920, E. M. G. Franklin: Chambersburg, 1898, Porter. Jefferson, Lancaster: Porter's Flora. Northampton: Easton, 1895, Porter. Philadelphia: Porter's Flora. Westmoreland: N. A. Species of Panicum.



Fig. 25. *Panicum miliaceum* (Hog Millet).

3. PANICUM MILIACEUM L.

[Fig. 25.]

Hog Millet, Broomcorn Millet.

An annual; culms stout, usually erect, 2-10 dm. high, nodes pubescent, usually hispid below the nodes; sheaths loose, papillose-hispid; blades pubescent on both surfaces, sometimes nearly smooth, 1-3 dm. long, 8-20 mm. wide; panicles rather dense, 1-3 dm. long, more or less nodding, branches scabrous, spikelet bearing toward the end; spikelets 4.5-5 mm. long; first glume about $\frac{1}{2}$ as long as the spikelet, pointed; second glume and sterile lemma about equal; fruit reddish. July-September.

This species has been introduced from the Old World. It is not known in a wild state but has escaped from cultivation in the north-eastern and middle states. The seeds of this grass are found, along with seeds of other grasses, in the canary seed of commerce.

Distribution in Pennsylvania.

Dauphin, Lancaster: Porter's Flora. Lehigh: Sept. 7, 1912, H. W. Pretz. Luzerne: Porter's Flora; N. A. Species of Panicum. Northampton: Porter's Flora. Philadelphia: Porter's Flora; Herb. Phila. Acad. Sc.

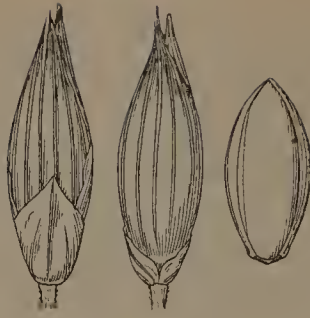


Fig. 26. *Panicum flexile* (Wiry Witch Grass).

4. **PANICUM FLEXILE** (Gattinger) Scribn.

[Fig. 26.]

Wiry Witch Grass.

Panicum capillare flexile Gattinger.

A slender annual; culms erect, 2-7 dm. high, usually branched below, with pubescent nodes; sheaths papillose-hispid; blades 1-3 dm. long, 2-6 mm. wide, erect, less stiff than in *P. capillare*, the branches being more erect; spikelets usually longer and more acuminate than those of *P. capillare*, or *P. philadelphicum*, 3.1-3.5 mm. long, smooth, solitary at the ends of the branches; first glume about $\frac{1}{3}$ as long as the spikelet; second glume a little longer than the sterile lemma, both acuminate and longer than the fruit. August-October.

Found in sandy soil of meadows and open woods from Ontario to S. Dakota, south to Florida and Texas. This plant is not common in Pennsylvania. It may be and probably is often mistaken for *P. capillare*.

Distribution in Pennsylvania.

Lancaster: Dillerville Swamp near Lancaster, Sept. 2, 1862, Porter.



Fig. 27. *Panicum capillare* (Witch Grass).

5. **PANICUM CAPILLARE** L.

[Fig. 27.]

Witch Grass. Tumbleweed.

An annual; culms 2-8 dm. high, erect or ascending, simple or sparingly branched, papillose-hispid or nearly glabrous; sheaths papillose-hispid; blades 10-25 cm. long, 5-15 mm. wide, more or less pubescent or hispid; panicle often $\frac{1}{2}$ the length of the plant, included in the sheath at the base until maturity, densely flowered, diffuse, spreading branches spikelet bearing toward the end, lateral panicles when present smaller; spikelets 2-2.5 mm. long, glabrous, pointed; first glume about $\frac{1}{2}$ as long as the spikelet; second glume and sterile lemma equal, pointed. July-October.

Common as a weed in cultivated fields and waste places. It is found from Nova Scotia to Dakota and Colorado and south to Florida and Texas.

Distribution in Pennsylvania.

Allegheny: Edgewood, Sept. 2, 1918, E. M. G. Chester, Dauphin, Delaware: Porter's Flora. Erie: Presque Isle, Aug. 24-26, 1905, C.

E. J. Franklin, Jefferson: Porter's Flora. Lancaster: 1884, Jas. Galen. Northampton: Easton, Aug. 25, 1896, A. A. Tyler. Philadelphia: Porter's Flora. Somerset: Stoystown, Aug. 3, 1886, B. H. P.

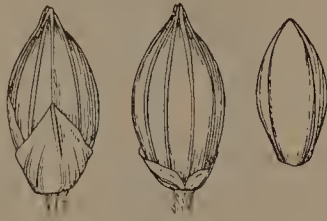


Fig. 28. *Panicum gattingeri*.

6. PANICUM GATTINGERI Nash.

[Fig. 28.]

Panicum capillare var. *campestre* Garr.

Panicum capillare *geniculatum* Scribn.

Panicum capillare gattingeri Nash.

An annual plant at first erect, later becoming decumbent and rooting at the lower nodes; culms papillose-hispid, 3-6 dm. long; sheaths hispid; blade 1-2 dm. long, 6-10 mm. wide, hispid or glabrous; panicles numerous, terminating culm and main branches, primary panicle 10-15 cm. long, the lateral ones smaller; spikelets 2 mm. long, elliptic, acute, glabrous; first glume about $\frac{2}{5}$ as long as the spikelet; second glume and sterile lemma equal, slightly longer than the fruit. August-October.

This species may be distinguished from *P. capillare* by its branching and spreading habit, and by its numerous panicles produced from all the nodes. It is often a weed in cultivated fields, from Pennsylvania to Iowa and Missouri, south to North Carolina and Tennessee.

Distribution in Pennsylvania.

Chester: Herb. Phila. Acad. Sc. Lancaster: Herb. Phila. Acad. Sc.; N. A. Species of *Panicum*. Lehigh: Sept. 8, 1917, Pretz, Herb. Phila. Acad. Sc. Montgomery: Herb. Phila. Acad. Sc. Philadelphia: Porter's Flora; Herb. Phila. Acad. Sc.

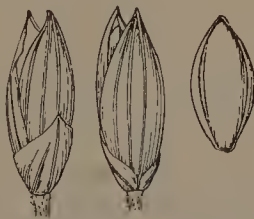


Fig. 29. *Panicum philadelphicum*.

7. PANICUM PHILADELPHICUM Bernh.

[Fig. 29.]

Panicum capillare sylvaticum Torr. (not Lam.)

Panicum minimum Scribn & Merr.

A slender tufted annual; culms 15-50 cm. high; yellowish green, slender, papillose-hispid, usually zigzag below, lower internodes short; sheaths papillose-hispid; blades erect, 4-15 cm. long, 2-6 mm. wide, more or less pubescent; panicle terminating the culm and branches, the former usually long exserted, the latter often

partly included in the sheath, usually loose and few flowered; spikelets usually in twos at the end of the slender divergent branches, 1.7-2 mm. long, short-pointed; first glume nearly $1/2$ as long as the spikelet; second glume and sterile lemma equal, slightly exceeding the fruit. August-September.

Found in dry woods and thickets from Maine to Wisconsin, south to Georgia, Texas and Oklahoma.

Distribution in Pennsylvania.

Allegheny: Edgewood, 1917, E. M. G. Bucks: Nockimixon Cliffs, Porter's Flora. Jefferson, Lancaster: Porter's Flora. Lebanon: Inwood, Sept. 18, 1923, E. M. G. Somerset: Stoystown, Aug. 24, 1885, B. H. P. York: McCall's Ferry, Sept. 7, 1903, B. H. Smith. Philadelphia: Porter's Flora.

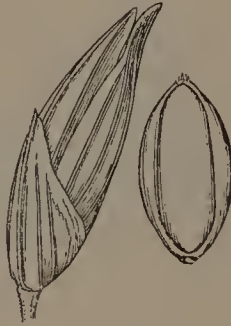


Fig. 30. *Panicum anceps*.

8. PANICUM ANCEPS Michx.

[Fig. 30.]

Panicum rostratum Muhl.

Perennial from a stout scaly rootstock; culms 6-12 dm. high, stout, compressed, smooth; sheaths glabrous, or the lower ones pubescent; blades 1.5-5 dm. long, 6-10 mm. wide; panicle 2-5 dm. long, open, slender branches spreading; spikelets, 3.5 mm. long, crowded, curved, scabrous pedicel short; first glume less than $1/2$ the length of the spikelet; the second glume and sterile lemma curved at the point, much longer than the fruit, which is minutely pubescent at the apex. July-September.

This grass is found in moist sandy soil from Rhode Island to Kansas and southward.

Distribution in Pennsylvania.

Bucks, Chester: Porter's Flora. Dauphin: Manada Gap, Aug. 20, 1921, E. M. G. Delaware: Chester, July 22, 1920, E. M. G. Lancaster: 1884, Jas. Galen; 1919, E. M. G. Lebanon, Lehigh, Montgomery, Northampton: Porter's Flora. Philadelphia: Aug. 9, 1878, F. L. Scribner; Monument Cemetery, Aug. 15, 1898, A. F. K. Krout.

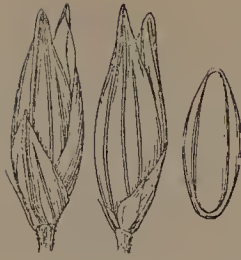


Fig. 31. *Panicum longifolium* (Long-leaved Panic Grass).

9. **PANICUM LONGIFOLIUM** Torr.

[Fig. 31.]

Long-leaved Panic Grass.

Panicum anceps pubescens Vasey.

Panicum pseudanceps Nash.

A densely tufted perennial with long basal leaves; culms 3.5-8 dm. high, compressed, glabrous; sheaths glabrous or villous toward the summit; sheath ciliate; blades erect, sometimes recurved, 8-40 cm. long, 2-5 mm. wide, pilose on the upper surface at the base, sometimes underneath; panicle purplish, 1-2.5 dm. long, about $\frac{1}{2}$ as wide, not densely flowered; spikelets 2.4-2.7 mm. long, acute; first glume about $\frac{2}{5}$ as long as the spikelet; second glume a little longer than the sterile lemma, both pointed and scabrous on the keel at the apex.

This species is found on moist sandy soil, mostly near the coast from Rhode Island to Florida and west to Texas. No Pennsylvanian specimens have been seen except from the eastern part of the state.

Distribution in Pennsylvania.

Bucks: Bristol, Aug. 5, 1866, Herb. Phila. Acad. Sc. Delaware: Herb. Phila. Acad. Sc. Lehigh: Sept. 23, 1917, H. W. Pretz, Herb. Phila. Acad. Sc. Montgomery: Herb. Phila. Acad. Sc. Northampton: Porter's Flora. Philadelphia: N. A. Species of Panicum.

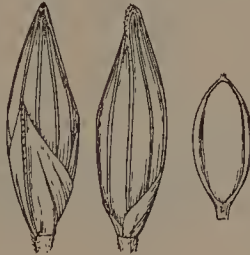


Fig. 32. *Panicum stipitatum*.

10. **PANICUM STIPITATUM** Nash.

[Fig. 32.]

Panicum elongatum Pursh.

A purplish or almost red, flat stemmed perennial; culms 5-10 dm. high, stout, flat, branched, smooth; sheaths overlapping, smooth; blades elongated, usually overtopping the panicle, 4-8 mm. wide, scabrous; panicles terminating the culm and branches, usually dark purple, 10-20 cm. long, very densely flowered; spikelets 2.5-2.8 mm. long, narrow, pointed, distinctly placed on one side of the branchlets; first glume about $\frac{1}{2}$ as long as the spikelet; second glume and sterile lemma nearly equal, acuminate; fruit with a short stem or stipe. July-September. This species resembles *P. agrostoides* Spreng. Typical specimens, however, differ from that species in the stipitate fruit and the second arrangement of the spikelets on the branches, also in length of spikelet.

It is found on moist soil from Connecticut to South Carolina and west to Kentucky, Missouri, and Texas.

Distribution in Pennsylvania.

Berks: Sept. 18, 1875, T. J. Oberly. Bucks: Tulleytown, Aug. 28, 1918, E. M. G. Chester: N. A. Species of *Panicum*. Fayette: Ohiopyle, Aug. 18, 1918, E. M. G.; Ohiopyle, Sept. 6, 1905, Bright. Franklin: Chambersburg, 1897, Porter; N. A. Species of *Panicum*. Northampton: Porter's Flora. Philadelphia: Sept. 1898, (Krout) Porter.

Fig. 33. *Panicum agrostoides* (Red-top Panic).11. *PANICUM AGROSTOIDES* Spreng.

[Fig. 33.]

Redtop Panic.

A tufted perennial with numerous short leaves clustered at the base; culm erect, smooth, 5-10 dm. high; sheath longer than the internodes, smooth, or sometimes hairy near the juncture with blade; blades 2-5 dm. long, 5-12 mm. wide; panicle often purplish, 1-3 dm. long, branches ascending, naked at the base, branchlets densely flowered mostly from lower side, the short pedicels sometimes bearing one or more white hairs which are $\frac{1}{4}$ to $\frac{1}{3}$ as long as the spikelet; spikelets 1.8-2 mm. long; first glume about $\frac{1}{2}$ as long as the spikelet; second glume and sterile lemma nearly equal. July-September.

Found on wet ground from Maine to Minnesota, south to Florida and Texas.

Distribution in Pennsylvania.

Bucks: North of Tulleytown, Aug. 29, 1922, E. M. G. Dauphin: Manada Gap, Aug. 20, 1920, E. M. G. Fayette: Ohiopyle, Aug. 18, 1918, E. M. G.; Sept. 1, 1901, J. A. S. Lancaster: Porter's Flora. Monroe: Delaware Water Gap, Aug. 8, 1920, E. M. G., O. E. J., G. K. J. Northampton: Porter's Flora. Somerset: Stoystown, Aug. 14, 1874, B. H. P.

Fig. 34. *Panicum condensum*.12. *PANICUM CONDENSUM* Nash.

[Fig. 34.]

Agrostis purpurascens Bert.

A perennial; culms erect, stout, 6-12 dm. high, smooth, compressed at the base; sheaths usually glabrous, compressed; blades 2-4 dm. long, 6-8 mm. wide, erect,

smooth, often a few long hairs at the base; panicles terminal and axillary, 10-25 cm. long, rarely more than 5 cm. wide, densely flowered; spikelets 2.2-2.5 mm. long, smooth, pointed; first glume about $\frac{1}{2}$ as long as the spikelet; second glume and sterile lemma nearly equal, both pointed. August-September.

This species is similar to *P. agrostoides* from which, in typical specimens, it may be distinguished by its very dense contracted panicle.

It is a southern species not having been reported, so far as is known, farther north than Pennsylvania. It is found along streams and in wet places from Pennsylvania to Florida and west to Texas; also in the West Indies.

Distribution in Pennsylvania.

Franklin: Chambersburg, 1897, Porter.



Fig. 35. *Panicum amarum*.

13. PANICUM AMARUM Ell.

[Fig. 35.]

Panicum amarum var. *minor* Vasey & Scribn.

Panicum amaroides Scribn. & Merr.

Perennial from a thick creeping root-stock; culms 3-10 dm. high, stout, smooth or hairy along the margin; ligule hairy; blade long, firm, flat or involute toward the apex in drying; panicle 15-50 cm. long, narrow, the short branches appressed; spikelets 5-6.5 mm long; first glume about $\frac{3}{4}$ as long as the spikelet, pointed; second glume a little longer than the sterile lemma, both pointed and longer than the fruit.

This species resembles *P. virgatum* somewhat but can be distinguished by its narrow elongated panicle.

On account of the long root-stock, this is a good sand binder. It is found in sand along the coast from Connecticut to Georgia. Hitchcock and Chase (The N. A. Species of Panicums) do not list this as occurring in Pa. There is, however, a specimen in the Herbarium of the Philadelphia Academy of Science labeled *P. amaroides*

Scribn. & Merr. which was collected in Philadelphia Oct. 1, 1865. Probably only transient.

Distribution in Pennsylvania.

Philadelphia: Below Navy Yard. Herb. Phila. Acad. Sc.; Porter's Flora.



Fig. 36. *Panicum virgatum* (Switch Grass).

14. PANICUM VIRGATUM L.

[Fig. 36.]

Switch Grass.

A tufted perennial from a stout, creeping root-stock; culms 5-20 dm. high, sometimes glaucous or purplish; sheaths longer than the lower internodes but often shorter than the upper ones; ligules dense, long; blades elongated, 3-15 mm. wide; panicles 1.5-5 dm. long, sometimes contracted but often spreading; spikelets often purple, 3.5-5 mm. long, ovate, acuminate; first glume about $\frac{2}{3}$ as long as the spikelet, pointed; second glume longer than the sterile lemma, both pointed and longer than the fruit. August-September.

This species is very variable. The blades are usually smooth or pilose above near the base, but sometimes the entire blade may be pilose. The plant is usually sufficiently distinct in some characters, particularly in the spikelet and in general appearance to be easily identified.

It is common along the sandy shores of rivers, on low open ground, prairies, and salt marshes from Maine to Manitoba and southward.

Distribution in Pennsylvania.

Allegheny: Six Mile Island, Ohara Twp.: Dixmont, Sept. 6, 1919, E. M. G.; Aug. 9, 1898, S. N. Rhodes. Bucks: Andalusia, Aug. 28, 1922, E. M. G. Chester: Porter's Flora. Clarion: Foxburg, along Clarion river, Aug. 13, 1919, E. M. G. Dauphin: On Island, Harrisburg, July 8, 1919, E. M. G. Delaware: Tinicum, Sept. 1, 1900, B. H. Smith; Marcus Hook, July 21, 1920, E. M. G. Erie: Presque Isle, Aug. 12, 1879, Guttenberg; Presque Isle, Aug. 17, 1919, E. M. G. Fayette: Ohiopyle, Aug. 18, 1918, E. M. G. Lancaster: Moist sandy soil, Aug. 1884, E. T. Aschman; 1884, Jas. Galen. Luzerne: Porter's

Flora. Monroe: Delaware Water Gap, Aug. 3, 1920, E. M. G., O. E. J. Northampton: Easton, Aug. 12, 1896, A. A. Tyler. Philadelphia: Along Delaware river, Oct. 1, 1898, A. F. K. Krout.

15. *PANICUM VIRGATUM CUBENSE* Griseb.

Panicum virgatum var. *obtusum* Wood.

Panicum virgatum var. *breviramosum* Nash.

This subspecies is usually more slender than the species and has a contracted, narrow panicle with ascending branches. The spikelets are smaller (2.8-3.2 mm. long) with shorter pointed second glume and sterile lemma. The first glume is shorter in proportion to the length of the spikelet than in the species, being only about 1/2 as long.

It is found along the Atlantic Coast from Connecticut to Florida. Found in Michigan by J. H. Ehlers in August, 1920. See *Rhodora* 23: 200. 1921. At present it has been collected in the eastern part of the state of Pennsylvania as listed below.

Distribution in Pennsylvania.

Delaware: Sept. 20, 1908, T. W. Pennell; Herb. Phila. Acad. Sc. Lancaster: July 8, 1904, Carter. Philadelphia: N. A. Species of *Panicum*.



Fig. 37. *Panicum depauperatum*.

16. *PANICUM DEPAUPERATUM* Muhl.

[Fig. 37.]

Panicum strictum Pursh.

A tufted perennial; culms 2-4 dm. high, usually smooth, slender; sheaths smooth or hirsute; blades very long and narrow, 6-15 cm. long, 2-5 mm. wide, crowded at the base, scabrous, or sometimes pubescent underneath; primary panicle usually not much longer than the leaves, sometimes exceeded by the upper leaves, secondary panicles on very short basal branches and often concealed by the leaves; spikelets 3.2-3.8 mm. long, pointed, glabrous or sparsely pubescent; first glume about 1/3 as long as the spikelet; second glume and sterile lemma extending beyond the fruit and forming a short beak. June-September.

Found in dry places and open woods from Maine to Minnesota and south to Georgia and Texas.

Distribution in Pennsylvania.

Chester: Porter's Flora. Dauphin: Inglenook, June 12, 1922, E. M. G. Delaware: Porter's Flora. Franklin: Mt. Alto, May 17, 1921,

E. M. G. Lancaster: 1884, F. T. Aschman; Rawlinsville, June 6, 1922, E. M. G. Monroe: Tobyhanna, May 30, 1921, E. M. G. Northampton: Easton, 1897, Porter. Pike: Porter's Flora. Schuylkill: Penryn, Small; Broad Mountain, Pretz.



Fig. 38. *Panicum linearifolium* (Linear-leaved Panicum).

17. PANICUM LINEARIFOLIUM Scribn.

[Fig. 38.]

Linear-leaved Panicum.

A densely tufted, light green perennial; culms 2-4.5 dm. high, slender, erect, glabrous, or minutely puberulent; sheaths usually sparsely pilose; blades 10-25 cm. long, 2-4 mm. wide, erect, scabrous on both surfaces, or often pubescent beneath, usually ciliate at the base; panicle loose, open, usually long exserted, 5-10 cm. long, about 1/2 as wide, few flowered; spikelet 2.2-2.7 mm. long, obtuse, pubescent; first glume about 1/4 as long as the spikelet; second glume and sterile lemma equaling the fruit at maturity. May-July.

Found on dry soil, hillsides and woods, from New England and Virginia, west to Iowa, Missouri, and Texas.

Distribution in Pennsylvania.

Allegheny: Golf ground, Edgewood, June 15, 1918, E. M. G. Berks, Bucks: Porter's Flora. Butler: Near Renfrew, June 19, 1920, E. M. G. Dauphin: Hummelstown, July 10, 1920, E. M. G. Delaware: Newtown, June 25, 1901, B. H. Smith. Lancaster: June, 1884, Jas. Galen; Conewago, July 18, 1920, E. M. G. Lebanon: Porter's Flora. Northampton: Steep hillside in woods. Easton, June 19, 1896, Porter. York: N. A. Species of Panicum.



Fig. 39. *Panicum wernerii*.

18. PANICUM WERNERII Scribn.

[Fig. 39.]

"Vernal form similar to that of *P. linearifolium*, typical specimens differing as follows: Culms stiffer, nodes usually sparingly pilose, sheaths glabrous, often shorter than the internodes; blades firmer, shorter and wider, 15 cm. long or less, the lower culm blades 3.5 to 6 cm. long, 3 to 6 mm. wide, a few long hairs at the rounded base, scabrous on both surfaces, not pubescent; spikelet 2.1 to 2.4 mm. long, 1.2 to 1.3 mm. wide, nearly or quite glabrous. Autumnal form similar to the vernal, remaining simple or late in the season bearing simple branches from the lower, rarely from the basal, nodes." June-July.

Found in sterile woods and knolls from Maine to Minnesota and south to Ohio and Texas. The description is from Hitchcock and Chase, N. A. Species of Panicum.

Distribution in Pennsylvania.

Lehigh: June 22, 1912, Daniel W. Hamm. Northampton: Easton, June 4, 1897; June 16, 1898; June 7 and 17, 1898. Note:—The first two specimens here listed from Northampton were labeled *P. linearifolium* by Porter; the last two were labeled *P. depauperatum* by Porter. Perry: New Bloomfield, July 16, 1920; Losh's Run, June 19, 1923, E. M. G.

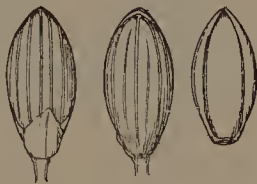


Fig. 40. *Panicum microcarpon*.

19. PANICUM MICROCARPON Muhl.

[Fig. 40.]

Panicum microcarpon Muhl; Ell. Bot. S. C. & Ga. 1:127, 1816, not *Panicum microcarpon* Muhl. Descr. Gram. 111. 1817. *P. polyanthes* Schult.

Panicum nitidum ramulosum Torr.

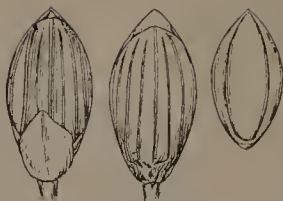
Panicum barbulatum Amer. Author., not Michx.

A tufted perennial; culms simple at first, later much branched from all the nodes, 3-10 dm. high; nodes bearded with reflexed hairs; sheaths much shorter than the internode, smooth, or the lower ones sometimes pilose, ciliate on the margin; blades thin, 10-12 cm. long, 8-12 mm. wide, spreading, smooth, or sometimes a few hairs near the base; panicles exserted, 8-12 cm. long, slender, branches ascending, many-flowered; spikelets 1.5-1.6 mm. long, smooth, rarely minutely pubescent, first glume about 1/4 as long as the spikelet; second glume slightly shorter than the sterile lemma. June-September.

This species is found in wet woods and swampy places from Massachusetts to Illinois and southward to Florida and Texas. It resembles *P. barbulatum* Michx. and *P. dichotomum*. It may be distinguished from the former by its shorter spikelets and from the latter by its bearded nodes.

Distribution in Pennsylvania.

Allegheny: Edgewood, Sept. 2, 1917, E. M. G. Bucks: Herb. Phila. Acad. Sc. Chester: Herb. Phila. Acad. Sc. Dauphin: Harrisburg. Aug. 29, 1920, E. M. G. Delaware: Herb. Phila. Acad. Sc. Fayette: Vicinity of Ohiopyle, July 4, 1908, O. E. J. Juniata: Mexico, Aug. 9, 1921, E. M. G. Lebanon: Mt. Gretna, July 4, 1923, E. M. G. Lehigh, Northampton: Herb. Phila. Acad. Sc. Perry: New Bloomfield, Sept. 29, 1920, E. M. G. Philadelphia: Herb. Phila. Acad. Sc.

Fig. 41. *Panicum lucidum*.20. *PANICUM LUCIDUM* Ashe.

[Fig. 41.]

Panicum tarodiorum Ashe.

Vernal form at first erect resembling that of *P. dichotomum*, soon becoming decumbent, sheaths glabrous, blades thin, bright green, glabrous, 4-7 cm. long, 4-6 mm. wide; panicle resembling those of *P. dichotomum*; spikelets 2-2.1 mm. long, glabrous, first glume about $\frac{2}{5}$ as long as the spikelet; second glume and sterile lemma more strongly nerved than in *P. dichotomum*, both shorter than the fruit at maturity. Autumnal form branching and forming large mats of weak, vinelike culms. June-September.

The only specimen seen from Pennsylvania is one in the Herbarium of the Philadelphia Academy of Science collected by Alex. MacElwee, July 12, 1899, at Willow Grove, Montgomery County. This species is found in wet woods and sphagnum swamps, along the coastal plain from New York to Florida and west to Texas. Hitchcock and Chase list it from north-western Indiana along the Great Lakes. It may be found in such a place as Presque Isle, Erie County. For a fuller account of the species see N. A. Species of *Panicum* by Hitchcock and Chase, page 198.

Fig. 42. *Panicum yadkinense*.21. *PANICUM YADKINENSE* Ashe.

[Fig. 42.]

Panicum maculatum Ashe. (not Abbl.)

"Vernal form similar to that of *P. dichotomum* but culms taller and stouter, sometimes 1 meter high; sheaths usually bearing pale, glandular spots; blades 9 to 13 cm. long, 8 to 11 mm. wide; panicle about 10 to 12 cm. long, about three-fourths as wide, the long lower branches ascending; spikelet 2.3 to 2.5 mm. long, 1 mm. wide, elliptic to subfusiform, pointed, glabrous; first glume about one-third the length of the spikelet, usually blunt; second glume and sterile lemma rather faintly nerved, equal, exceeding the fruit and forming a slight point beyond it. Autumnal form erect or leaning, loosely branched from the middle nodes, the blades smaller but not conspicuously reduced."

Found in moist woods and thickets from Pa. to Georgia and west to southern Illinois and Louisiana. Description from Hitchcock and Chase, N. A. Species of *Panicum*.

Distribution in Pennsylvania.

Chester: Aug. 6, 1911. E. B. Bartram. Delaware: Herb. Phila. Acad. Sc. Northampton: Easton, Porter. Philadelphia: Wissahickon Creek, Sept. 24, 1898, Krout.

Note:—The Chester County and the Delaware County specimens were both identified as *P. dichotomum*.



Fig. 43. *Panicum dichotomum*.

22. *PANICUM DICHOTOMUM* L.

[Fig. 43.]

Panicum angustifolium LeC.

Panicum dichotomum viride Vasey.

Panicum dichotomum divaricatum Vasey.

Panicum nitidum pauciflorum Britton.

Panicum nitidum viride Britton.

Panicum dichotomum commune Wats.

Panicum ramulosum viride Porter.

A tufted, often purplish perennial; culms 3-5 dm. high, smooth or with a few spreading hairs on the lower nodes; sheaths much shorter than the internodes, smooth, or the lower ones sparingly pubescent; blades 5-11 cm. long, 4-8 mm. wide, glabrous or sometimes with a few long hairs on the margin at the base; panicle exerted, 4-9 cm. long, slender branches flexuous, spikelet bearing at the ends; spikelets 2 mm. long, elliptic, glabrous; first glume about $\frac{1}{3}$ as long as the spikelet; second glume and sterile lemma nearly equal; fruit slightly exposed at maturity. Autumnal form branched from about the middle, without branches below, leaves much smaller and numerous. May-August.

This species resembles *P. barbulatum* which, however, may be distinguished by its bearded nodes and by its unexposed fruit.

Found in woods and thickets from New Brunswick to Michigan, south to Florida and Texas.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 15, 1918, E. M. G.; Fricks woods, July 17, 1918, E. M. G. Chester: Porter's Flora. Dauphin: Ingle-nook, June 12, 1922; Manada Gap, Aug. 20, 1921, E. M. G. Delaware: Tinicum, Porter's Flora. Lancaster: Aug. 1886, Jas. Galen; McCall's Ferry, June 7, 1922, E. M. G. Lebanon: Mt. Gretna, July 4, 1923, E. M. G. Lehigh: Mountainville, Pretz. Monroe: Godfrey Ridge, Stroudsburg, Aug. 24, 1920, E. M. G., O. E. J. Northampton: Easton 1899, Porter. Perry: Losh's Run, June 21, 1923, E. M. G. Philadelphia, Pike: Porter's Flora. Westmoreland: Hillside, June 12, 1920, E. M. G. York: N. A. Species of *Panicum*.

Fig. 44. *Panicum barbulatum*.23. **PANICUM BARBULATUM** Michx.

[Fig. 44.]

A slender perennial; culms 5-8 dm. high, erect, lower nodes usually bearded; sheath smooth but usually with a puberulent ring at the top, and the lower ones sometimes softly pubescent; blades 6-10 cm. long, 6-10 mm. wide, glabrous; panicle exserted, 1 dm. or less long, about the same width; branches spikelet bearing at the end; spikelets 2 mm. long, smooth; first glume about $\frac{1}{4}$ as long as the spikelet; second glume and sterile lemma equal and covering the fruit at maturity, smooth. May-August.

This is a slender perennial which is very similar to *P. dichotomum* L., with which Britton and Brown, 2nd ed. makes it synonymous. It may be distinguished, however, from that species by its bearded lower nodes, by its somewhat wider leaves (6-10 mm.) and by the tip of the fruit not being exposed at maturity.

Rocky woods and hillsides from Massachusetts to Michigan, southward to Georgia and Texas.

Distribution in Pennsylvania.

Allegheny: Edgewood, Early summer, 1917, E. M. G. Chester: Porter's Flora. Delaware: Tinicum, Porter's Flora. Fayette: Ohio-pyle, Sept 1, 1901, J. A. S. Lancaster, Northampton: Porter's Flora. Perry: Losh's Run, June 21, 1923, E. M. G.

Fig. 45. *Panicum boscii*.24. **PANICUM BOSCHII** Poir.

[Fig. 45.]

Panicum latifolium Walt. (not L.)*Panicum walteri* Poir.*Panicum porterianum* Nash.

A perennial in large clumps; culms 4-7 dm. high, smooth or minutely pubescent, nodes densely retrorsely bearded; sheaths shorter than the internodes, glabrous or puberulent with a pubescent ring at the top; blades 7-12 cm. long, 1.5-3 cm. wide, sparsely ciliate toward the base, glabrous or slightly pubescent; panicle 6-12 cm. long, about the same width; spikelets 4-4.5 mm. long, pubescent; first glume about $\frac{1}{3}$ as long as the spikelet; second glume nearly as long as the sterile lemma; fruit minutely pubescent and usually black at the tip. June-August.

It is sometimes difficult to distinguish *P. boscii* from pubescent forms of *P. latifolium*. The nodes, however, of *P. boscii* are usually very distinctly bearded.

This grass is found in woods from Massachusetts to Missouri and southward.

Distribution in Pennsylvania.

Delaware: Chester, July 22, 1920, E. M. G. Fayette: Ohio-pyle, Sept. 1, 1901, J. A. S. Lancaster: N. A. Species of Panicum; McCall's Ferry, June 7, 1922, E. M. G. Monroe: Godfrey Ridge, Stroudsburg, Aug. 4, 1920, E. M. G., O. E. J., G. K. J. Westmoreland: Hillside, June 7, 1919, E. M. G.

25. PANICUM BOSCHII MOLLE (Vasey) Hitchc. & Chase.

Panicum latifolium molle Vasey.

Panicum walteri molle Porter.

Panicum pubifolium Nash.

This variety resembles the species but the culm is more downy-puberulent; sheaths are sparsely puberulent throughout; the blades velvety pubescent underneath and sparsely appressed pubescent on the upper surface. The whole plant has a softer feeling and a more glaucous appearance.

The variety has about the same distribution and habitat as that of the species, June-August.

Distribution in Pennsylvania.

Chester: West Chester, N. A. Species of Panicum. Fayette: Ohio-pyle, Sept. 1, 1901, J. A. S. Northampton: Chestnut Hill, Easton, June 17, 1899, Porter. Philadelphia: Germantown, N. A. Species of Panicum.



Fig. 46. *Panicum latifolium* (Broad-leaved Panic Grass).

26. PANICUM LATIFOLIUM L.

[Fig. 46.]

Broad-leaved Panic Grass.

Panicum macrocarpon Le Conte. (not Torr.).

A perennial from a short knotted root-stock or crown; culms 4-10 dm. high, smooth, sometimes sparsely pubescent below, nodes glabrous, rarely with a few hairs; sheaths shorter than the internodes, margin ciliate, a ring of pubescence at the top, lower sheaths sometimes slightly pubescent; ligule not visible; blades 8-18 cm. long, 1.5-4 cm. wide, smooth, occasionally with a few hairs on both surfaces; panicle 7-15 cm. long, branches ascending, few flowered; spikelets 3.4-3.7

mm. long, pubescent; first glume about $\frac{1}{3}$ as long as the spikelet; second glume and sterile lemma barely covering the fruit at maturity. Autumnal form branching from the middle nodes, the small panicles partly included in the sheath. June-August.

Found in sandy or rocky woods from Maine to Minnesota and southward to North Carolina and Kansas.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 15; July 20, 1918, E. M. G.; Glesshaw, July 22, 1918, E. M. G. Bucks: Rockdale, Porter's Flora. Cambria: Johnstown, June 17, 1874, B. H. P. Chester: West Chester, N. A. Species of *Panicum*. Columbia: Jamison City, June 22, 1922, E. M. G. Delaware: Porter's Flora. Lancaster: McCall's Ferry, N. A. Species of *Panicum*. Monroe: Porter's Flora. Northampton: Chestnut Hill, Easton, June 14, 1898, Porter. Perry: New Bloomfield, July, 16, 1920, E. M. G. Philadelphia: Germantown, N. A. Species of *Panicum*. Pike: Porter's Flora. Westmoreland: Hillside, June 8, 1919, E. M. G.



Fig. 47. *Panicum clandestinum*.

27. *PANICUM CLANDESTINUM* L.

[Fig. 47.]

Panicum pedunculatum Torr.

Panicum decoloratum Nash.

A perennial in large clumps; culms stout, 7-15 dm. high, simple at first, branched later, usually papillose-hispid; sheath loose, papillose-hispid or nearly glabrous, usually a puberulent ring at the summit; ligules short; blades 10-20 cm. long, 1.2-3 cm. wide, scabrous toward the apex, ciliate at the base; panicle 8-15 cm. long, nearly as wide, branches ascending; spikelets 2.7-3 mm. long, elliptic, sparsely pubescent; first glume about $\frac{1}{3}$ as long as the spikelet; second glume a little shorter than the sterile lemma which is subacute. June-July.

In autumn secondary panicles, which are usually included in the sheaths, arise from the middle and upper branches. Specimens occur which are nearly or quite smooth, resembling *P. latifolium*. These have, however, the spikelet of *P. clandestinum*.

This species is found in sandy soil from Maine to Kansas, southward to Florida and Texas. It is common in Pennsylvania.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 8, 1918, E. M. G. Bucks: Porter's Flora. Cambria: Portage, Aug. 8, 1919, E. M. G. Chester: Porter's Flora. Crawford: Conneaut Lake, July 11, 1923, E. M. G. Cumber-

land: New Cumberland, July 5, 1920, E. M. G. Dauphin: On island at Harrisburg, July 8, 1919, E. M. G. Delaware: Marcus Hook, July 21, 1920, E. M. G. Franklin, Huntingdon: Porter's Flora. Lancaster: McCall's Ferry, June 7, 1922, E. M. G. Monroe: Tobyhanna, Aug. 12, 1920, E. M. G. Montgomery: Porter's Flora. Northampton: Easton, July 16, 1896, A. A. Tyler; Chestnut Hill, Easton, June 24, 1899, Porter. Philadelphia, Pike, Venango: Porter's Flora. Westmoreland: Ligonier, June 23, 1904, O. E. J.



Fig. 48. *Panicum xanthophysum*.

28. PANICUM XANTHOPHYSUM Gray.

[Fig. 48.]

A loosely tufted, yellowish, perennial; culms 2-5.5 dm. high, smooth; sheaths papillose-pilose, ciliate margin; blades erect or ascending, prominently nerved, 10-15 cm. long, 1-2 cm. wide, smooth on both surfaces, ciliate at the base; panicle exserted, 5-12 cm. long, only about 1 cm. wide, few flowered; spikelets 3.7-4 mm. long, pubescent; first glume about 1/2 as long as the spikelet, pointed; second glume and sterile lemma about equal; fruit plump when mature. Autumnal form erect and branching from the second and third nodes. June-July-August.

This species is found in sandy or gravelly soil from Quebec to Minnesota and south to Pennsylvania. No specimen from Pennsylvania has been seen but it has been reported by Hitchcock and Chase and by Porter as listed below.

Distribution in Pennsylvania.

Bucks: Tullytown, Porter's Flora. Lycoming, Luzerne: Porter's Flora. Monroe: Tannersville, N. A. Species of Panicum.



Fig. 49. *Panicum scribnerianum*.

29. *PANICUM SCRIBNERIANUM* Nash.

[Fig. 49.]

Panicum macrocarpon Torr. (not LeConte.)*Panicum scoparium* S. Wats. (not Lam.)

A tufted perennial; culms 2-5 dm. high, glabrous or sparingly pilose; sheaths loose, papillose-pubescent or nearly glabrous; ligule short; blades ascending or erect, 5-10 cm. long, 6-12 mm. wide, glabrous above, appressed-pubescent or glabrous beneath, ciliate at the base; panicles short exserted, 4-8 cm. long, secondary panicles smaller and more or less included in the sheath; spikelet 3.2-3.3 mm. long, 2 mm. wide, sparsely pubescent or nearly glabrous; first glume about $\frac{1}{3}$ as long as the spikelet; second glume and sterile lemma nearly equal, obtuse, barely covering the fruit. Autumnal form branching from the middle and upper nodes. The species is very variable as to the amount of pubescence. June-August.

Found in dry or moist soil from Maine to British Columbia, southward to Virginia, Texas, and Arizona.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Chester: Barrens, Porter's Flora. Delaware: Porter's Flora. Erie: Presque Isle, Aug. 12, 1879, Guttenberg. Lancaster: Safe Harbor, 1864, Porter. Northampton: College Hill, Easton, June 7, 1898, Porter. Philadelphia: Porter's Flora.

Fig. 50. *Panicum spretum*.30. *PANICUM SPRETUM* Schult.

[Fig. 50]

Panicum catoni Nash.*Panicum octonodum* Smith.

Vernal culms tufted, 3-9 dm. high, erect, glabrous, the nodes swollen; sheaths shorter than the internodes, glabrous, or the lower one sometimes slightly pubescent; ligules 2-3 mm. long; blades 7-10 cm. long, 4-8 mm. wide, glabrous, slightly ciliate at the base; panicles 8-12 cm. long, about $\frac{1}{3}$ as wide, branches ascending, short spikelet-bearing branches in the axils; spikelets 1.4-1.6 mm. long, pubescent or rarely glabrous; first glume about $\frac{1}{4}$ as long as the spikelet; second glume and sterile lemma equaling the fruit at maturity. Autumnal form branching and reclining. May-August.

This species is found mostly near the coast from Maine to Texas; also found in northern Indiana. No specimen has been seen from Pennsylvania. Hitchcock and Chase (N. A. Species of Panicum) reports it from West Chester, Pennsylvania.

Fig. 51. *Panicum lindheimeri*.31. *PANICUM LINDHEIMERI* Nash.

[Fig. 51]

Vernal culms erect or ascending, 3-10 dm. high, glabrous or finely pubescent below; lower sheaths ascending-pubescent, the upper ones smooth except for the ciliate margin, about $\frac{1}{2}$ as long as the internodes; ligule 4-5 mm. long; blades 3-10

cm. long, 3-8 mm. wide, glabrous or minutely puberulent underneath, a few hairs on the margin at the base; panicle 4-7 cm. long, nearly as wide; spikelets 1.4-1.6 mm. long, obovate, pubescent; first glume about $\frac{1}{4}$ as long as the spikelet; second glume and sterile lemma about as long as the fruit. June-August.

This plant is found on dry sandy soil in woods or open ground from Maine to Florida, and west to southern California. The common form of the species is glabrous except the lower part of the plant. The more pubescent form resembles *P. tennesseense* but the spikelet is smaller than in that species.

Distribution in Pennsylvania.

Bucks, Chester: Herb. Phila. Acad. Sc. Dauphin: Inglenook, July 21, 1921, E. M. G. Delaware: Marcus Hook, July 21, 1920, E. M. G. Monroe: Delaware Water Gap, Aug. 5, 1920, E. M. G., O. E. J. Montgomery, Northampton: Herb. Phila. Acad. Sc.

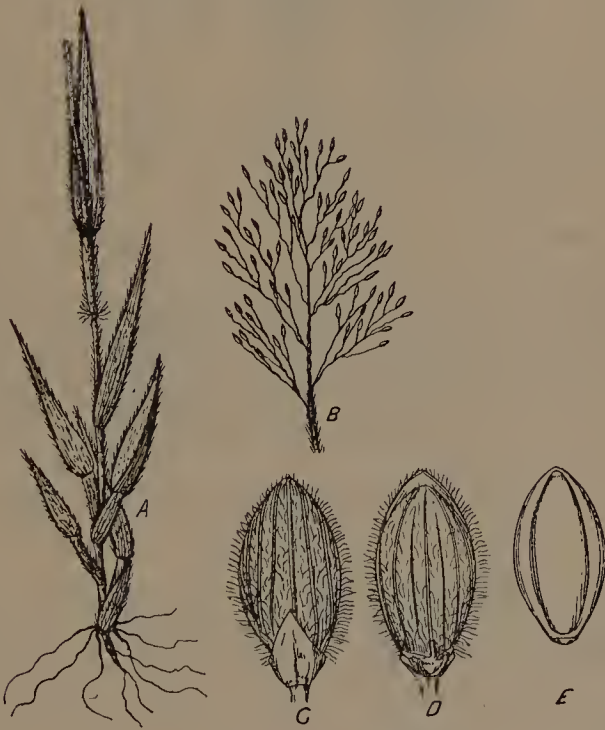


Fig. 52. *Panicum villosissimum*. A. Stem and leaves; B. Inflorescence; C. Spikelet; D. Reverse side of C; E. Grain.

32. *PANICUM VILLOSISSIMUM* Nash.

[Fig. 52]

Panicum dichotomum villosum Vasey.

Panicum atlanticum Nash.

Panicum haemocarpon Ashe.

Panicum xanthospermum Scribn. & Mohr.

A tufted, light green, very hairy perennial; culms 2.5-4.5 dm. high, very densely long-pubescent with white spreading hairs, which gives the plant a fuzzy appearance; nodes bearded; sheaths shorter than the internodes and pubescent like the

culms; ligules a tuft of hairs 4-5 mm. long; blades ascending, stiff, 6-10 cm. long, 5-10 mm. wide, involute toward the apex, appressed-pubescent on both surfaces; panicles short-exserted, 4-8 cm. long, nearly as wide; spikelets 2.2-2.3 mm. long, pubescent, usually purplish; first glume about $\frac{1}{3}$ as long as the spikelet; second glume and sterile lemma about equal, obtuse; fruit slightly exposed at maturity.

This species is found on sterile, usually sandy soil in open woods and hillsides, from Massachusetts to Maine, south to Florida and Texas.

Distribution in Pennsylvania.

Center: Near Scotia in sandy barrens, July 16, 1909, O. E. J. Chester: West Chester, N. A. Species of *Panicum*. Erie: On sand-plain, Presque Isle, June 11, 1906, O. E. J.



Fig. 53. *Panicum tsugetorum*.

33. PANICUM TSUGETORUM Nash.

[Fig. 53]

Panicum lanuginosum siccanum Hitchc & Chase, *Rhodora* 8: 207, 1906.

A tufted pale bluish green perennial; culms 3-5 dm. high, slender, crisp-pubescent with ascending hairs as are also the sheaths; ligules short; blades firm, margin white cartilaginous, erect, or ascending, 4-7 cm. long, 4-7 mm. wide, glabrous above, or with a few long hairs near the base, appressed-puberulent beneath; panicles 3-7 cm. long, about as wide, branches flexuous and spreading; spikelets 1.8-1.9 mm. long, short-pubescent; first glume about $\frac{1}{3}$ as long as the spikelet, acute; second glume and sterile lemma about equaling the fruit at maturity. June-September.

This species is found in dry sandy woods from Maine to Illinois, Virginia and Tennessee.

Distribution in Pennsylvania.

Lehigh: Perhaps one-fourth mile east or east of north of Bake-oven Knob, July 25, 1915, Harold W. Pretz. Monroe: Tannersville, Smith.



Fig. 54. *Panicum tennesseense*.

34. PANICUM TENNESSEENSE Ashe.

[Fig. 54]

A bluish green, often purplish, tufted perennial; culms 2.5-6 dm. high, papillose-pilose with spreading hairs; sheaths pubescent; ligule dense, 4-5 mm. long; blades 6-9 cm. long, 5-8 mm. wide, margin white, cartilaginous, upper surface glabrous or with a few long scattered hairs toward the base, the lower surface appressed-pubescent or nearly smooth; panicle usually purplish, 4-7 cm. long, nearly as wide;

spikelets 1.6-1.7 mm. long, pubescent; first glume about $\frac{1}{4}$ as long as the spikelet; second glume and sterile lemma nearly equal. The autumnal stage is much branched and spreading or decumbent, often forming large mats. July-August.

Found in open moist ground and borders of woods from Maine to Minnesota and south to Georgia, Mississippi and Arkansas; also in Colorado and Utah. It is very common in the western part of the state.

Distribution in Pennsylvania.

Allegheny: Edgewood, July & Sept., 1917, E. M. G.; June 15, 1918, E. M. G.; Glenshaw, July 18, 1918, O. E. J.; Field along edge of woods, Glenshaw, July 22, 1918, E. M. G.

Cambria: Johnstown, June 30, 1874, B. H. P. Cumberland: New Cumberland, July 5, 1920, E. M. G. Columbia: Jameson City, June 22, 1922, E. M. G. Dauphin: Manada Gap, Aug. 20, 1921; Italian Park, June 21, 1921, E. M. G. Delaware: Chester, July 23, 1920, E. M. G. Erie: Presque Isle, Sept. 9-11, 1905, J. A. S. Fayette: Ohioptyle, Sept. 1, 1901, J. A. S. Lancaster: Columbia, July 11, 1886, Jas. Galen; McCall's Ferry, June 7, 1922, E. M. G. Lebanon: Mt. Gretna, July 4, 1923, E. M. G. Monroe: Delaware Water Gap, Aug. 3, 1920, E. M. G., O. E. J. Northampton: Chestnut Hill, Easton, July 15, 1898; June 27, 1899, Porter. York: Accomac, July 13, 1919, E. M. G.



Fig. 55. *Panicum albemarlense*.

35. PANICUM ALBEMARLENSE Ashe.

[Fig. 55]

Culms cespitose, 25 to 45 cm. high, slender, erect; culms, sheaths, and blades grayish-villous; blades 4.6-7 cm. long, 3-6 mm. wide, villous on the upper surface; panicle 3-5 cm. long, about the same width; spikelets 1.4 mm. long, pilose; first glume less than $\frac{1}{2}$ as long as the spikelet; the second glume and sterile lemma subequal.

Found on low sandy soil of woods or open grounds from Connecticut to Michigan and southward. This plant is very similar to *P. meridionale* from which it may be distinguished by its stouter and more spreading culms and by its softer, more dense and grayish pubescence. The only specimens seen were in the Herb. of the Philadelphia Academy of Science as listed below.

Distribution in Pennsylvania.

Lehigh, Montgomery, Philadelphia: Herb. Phila Acad. Sc.

Fig. 56. *Panicum implicatum*.36. **PANICUM IMPLICATUM** Scribn.

[Fig. 56]

Panicum unciphyllum implicatum Scribn. & Merr.

A tufted erect perennial; culms slender, 2-5.5 dm. high, papillose-pilose; sheaths shorter than the internodes, papillose-pilose, ligules 4-5 mm. long; blades firm erect, 3-6 cm. long, 3-6 mm. wide, papillose-pubescent on both surfaces; panicles exserted, 3-6 cm. long, nearly as wide, axis long-pilose, the flexuous branches tangled (implicate); spikelets 1.5 mm. long, pubescent, purplish; first glume about 1/4 as long as the spikelet; second glume and sterile lemma equal. The autumnal form erect or spreading, branching from the middle and upper nodes. June-August.

This grass is found in wet meadows, bogs and swamps from Nova Scotia to New York and west to Michigan and Iowa. Hitchcock and Chase (N. A. Species of *Panicum*) do not report it from Pennsylvania. Porter, however, reports it from Northampton County and there are several specimens in the Herbarium of the Philadelphia Academy of Science. It is very much like *P. meridionale*, from which it may be difficult to distinguish.

Distribution in Pennsylvania.

Crawford: Conneaut Lake, July 11, 1923, E. M. G. Cumberland: New Cumberland, July 5, 1920, E. M. G. Forest: Jeffrey Farm, Aug. 1920, A. R. Hillard. Lehigh: Herb. Phila. Acad. Sc. Monroe: Tobyhanna, Aug. 14, 1920, E. M. G., O. E. J. Northampton: Porter's Flora.

Fig. 57. *Panicum meridionale*.37. **PANICUM MERIDIONALE** Ashe.

[Fig. 57]

Panicum filiculme Ashe.

A tufted perennial; culms 1.5-4.5 dm. high, pilose below, diminishing toward the top; lower sheaths pilose, upper ones minutely appressed-pubescent; ligule a ring of hairs, 3-4 mm. long; blades 1.5-4 cm. long, 2-4 mm. wide, long pilose on the upper surface, slightly pubescent underneath or nearly smooth; panicles exserted, 1.5-4 cm. long, nearly as wide; spikelets 1.3-1.4 mm. long, obtuse, minutely papillose-pubescent; first glume about 1/4 as long as the spikelet; second glume and sterile lemma equal, obtuse, equaling the fruit at maturity. Autumnal form erect or nearly so, branching from all the nodes. June-September.

This plant is found on sandy or sterile soil in woods from Rhode Island to Wisconsin, south to Alabama. It resembles *P. implicatum* from which it may be distinguished by its glabrous or merely pubescent axis while the axis of *P. implicatum* is pilose. J. A. Shafer collected a specimen on Presque Isle, Sept. 9, 1905, which he identified as *P. unciphyllum* Trin. which the writer has identified as *P. meridionale*. The writer on Aug. 17, 1919, collected in the same place a

specimen which appears to be the same species but some of the plants are much taller. Shafer's specimens were 8-18 cm. high, while those collected Aug. 17, 1919, were 26-45 cm. high. All plants are over ripe and are probably not typical.

Distribution in Pennsylvania.

Chester: Herb. Phila. Acad. Sc. Erie: Presque Isle, Sept. 9-11, 1905, J. A. S.; Aug. 17, 1919, E. M. G. Lancaster: Herb. Phila. Acad. Sc.



Fig. 58. *Panicum huachucae*.

38. PANICUM HUACHUCAE Ashe.

[Fig. 58]

Panicum nitidum pilosum Torr.

Panicum lanuginosum huachucae Hitchc.

Vernal form tufted, erect, light green, often purplish; culms 2-6 dm. high, papillose-pubescent, nodes bearded; sheaths shorter than the internodes, papillaceous-hirsute; ligules a ring of hairs 3-4 mm. long; blades firm, erect or ascending, 4-8 cm. long, 6-8 mm. wide, upper surface short pilose, especially toward the base, densely pubescent beneath; panicle 4-6 cm. long, about as wide, axis pilose; spikelets 1.6-1.8 mm. long, obovate, papillose-pubescent; first glume about $\frac{1}{3}$ as long as the spikelet; second glume and sterile lemma nearly equaling the fruit. June-September.

This species is found on dry soil from Maine to South Dakota and southward to North Carolina and California. It is often difficult to distinguish this species from *P. huachucae silvicola* which Britton and Brown, 2nd edition, makes synonymous with the species.

Distribution in Pennsylvania.

Allegheny: Dry field along edge of woods, Glenshaw, July 22, 1918, E. M. G. Bucks, Chester: Herb. Phila. Acad. Sc. Crawford: Dry woods east side of Conneaut Lake, July 23, 1901, J. A. S. Dauphin: Inglenook, June 12, 1922, E. M. G. Delaware: Chester, July 22, 1920, E. M. G. Lancaster: Rawlinsville, June 6, 1922, E. M. G. Lehigh: Herb. Phila. Acad. Sc. Monroe: Godfrey Ridge, Stroudsburg, Aug. 4, 1920, E. M. G., O. E. J. Montgomery: Herb. Phila. Acad. Sc. Perry: New Bloomfield, July 16, 1920, E. M. G. Philadelphia: Herb. Phila. Acad. Sc.

39. PANICUM HUACHUCAE SILVICOLA Hitchc. & Chase.

A tufted perennial; culms 3-7.5 dm. high, papillose-pubescent, nodes bearded; sheaths papillose-pilose; blades thin, lax, 5-10 cm. long, 6-12 mm. wide, upper surface sparsely short-pilose, lower surface pubescent, with a satiny luster; panicles 5-8 cm. long, about as wide; spikelets 1.6-1.8 mm. long, pubescent; first glume about $\frac{1}{4}$ as long as the spikelet; second glume and sterile lemma about equal, barely covering the fruit at maturity. June-September.

This species is found in open woods from Maine to Florida and west to Michigan, Nebraska, and Arizona. It is closely related to *P. huachucae* and to *P. tennesseense*. It is taller, more slender brighter green, more lax and less pubescent than *P. huachucae*. It may be distinguished from *P. tennesseense* by its lax leaves with no marked cartilaginous margins. It is difficult if not impossible to separate the variable forms of these three species with certainty.

Distribution in Pennsylvania.

Chester, Delaware: Herb. Phila. Acad. Sc. Fayette: Opposite Millsborough, July 9, 1901, J. A. S. Lancaster: McCalls Ferry, N. A. Species of *Panicum*; Conewago, July 18, 1920, E. M. G. Montgomery: Herb. Phila. Acad. Sc. Northampton: Easton, Porter.

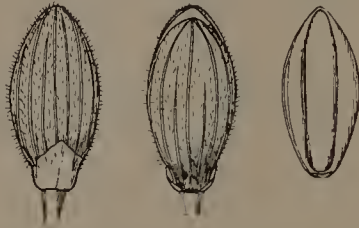


Fig. 59. *Panicum annulum*.

40. PANICUM ANNULUM Ashe.

[Fig. 59]

"Vernal form usually purplish, in small clumps or solitary; culms 35 to 60 cm. high, the nodes densely bearded; sheaths shorter than the internodes, velvety pubescent or the upper nearly glabrous; blades 6 to 12 cm. long, 7 to 13 mm. wide, densely velvety pubescent on both surfaces, the margin ciliate toward the base; panicle 6 to 8 cm. long, about three-fourths as wide, rather numerous flowered, the flexuous branches ascending or later spreading; spikelets 2 mm. long, elliptic, blunt; first glume one-fourth to one-third the length of the spikelet, obtuse; second glume and sterile lemma pubescent, the glume slightly shorter." June-July.

The description of this species was taken from "the N. A. Species of *Panicum*" by Hitchcock and Chase. There are specimens, in the Herbarium of the Philadelphia Academy of Science from the places listed below. It is found in dry rocky woods, New Jersey and Pennsylvania to Georgia, Missouri and Mississippi.

Distribution in Pennsylvania.

Chester: Sugartown Barrens and other locations. Delaware: Newtown Square, June 12, 1899, MacElwee.

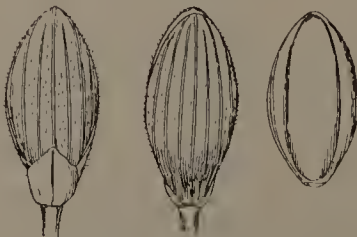


Fig. 60. *Panicum clutei*.

41. *PANICUM CLUTEI* Nash.

[Fig. 60]

Culms .5-1 m. high, glabrous, lower nodes bearded; sheaths pilose on the margin, puberulent at the summit; blades glabrous or only the lower ones pubescent, 6-12 cm. long, 6-12 mm. wide; panicle 6-10 cm. long, $1\frac{2}{3}$ as wide; spikelets 2.2-2.3 mm. long.

This species can hardly be distinguished from *P. mattamuskeetense* Ashe, which is not reported from Pennsylvania. The species is found in low moist ground and cranberry bogs from Massachusetts to North Carolina. There is doubt whether it has been found in Pennsylvania. A specimen in the Herbarium of the Philadelphia Academy of Science collected by Bayard Long, June 28, 1908, in Johnsonville, Northampton Co., bears the name *P. clutei* Nash. The plant was first identified as *P. boreale*, which it may be. If the species is found at all in Pennsylvania, it may be expected in the southeastern part of the state.

Fig. 61. *Panicum scoparium*.42. *PANICUM SCOPARIUM* Lam.

[Fig. 61]

Velvety Panic Grass

Panicum pubescens Lam.*Panicum viscidum* Ell.

A tufted, light green, velvety-pubescent perennial; culms 6-13 dm. high, villous, nodes villous with a viscid ring about 2 or 3 mm. wide immediately below; sheaths shorter than the internodes, velvety villous below becoming smoother toward the summit; blades thick, 12-20 cm. long, 10-18 mm. wide, pubescent; primary panicles exserted, 8-15 cm. long, nearly as wide, secondary much smaller, usually included, axis and branches with viscid blotches, branches spikelet-bearing to the base; spikelets 2.4-2.6 mm. long, obovate, pubescent; first glume about $\frac{1}{5}$ as long as the spikelet; second glume and sterile lemma about equal; fruit slightly exposed at maturity. June-August.

Found in moist soil from Massachusetts to Florida; west to Oklahoma and Texas; also found in Cuba. This species is easily recognized by its velvety pubescence and the glabrous, viscid ring below the nodes.

Distribution in Pennsylvania.

Delaware: Tinicum, July 20, 1901, B. H. Smith; Tinicum, Oct. 16, 1899, Porter.

43. *PANICUM COMMONSIANUM* Ashe.

[Fig. 62]

A densely tufted, grayish olive green perennial; culms 2-5 dm. high, appressed-pilose with erect hairs; sheaths shorter than the internodes, pilose with erect hairs; ligules short; blades firm, ascending, 5-9 cm. long, 4-7 mm. wide, margin involute,

glabrous on the upper surface, or with a few long hairs toward the base; lower surface strigose or glabrous; panicles long-exserted, 4-8 cm. long, about as wide, branches spreading, spikelet bearing toward the end; spikelets 2.2-2.4 mm. long, elliptic, pubescent; first glume nearly $1/2$ as long as the spikelet, pointed, 3-nerved; second glume a little shorter than the sterile lemma and fruit at maturity. Autumnal form branches from the middle and upper nodes, becoming spreading or prostrate. June-July.

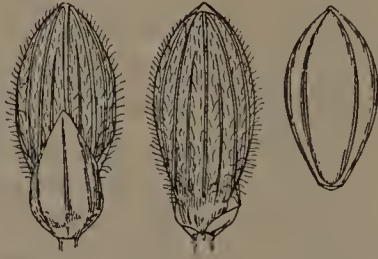


Fig. 62. *Panicum commonsianum*.

This species is found on dunes and in sandy woods near the coast from Connecticut to Florida. The above description is from a specimen from Ashe's Herbarium (Ex. Herb. A. Commons) which was collected on "drifting sands along the coast, Cape May, N. J., June 29, 1898." The only specimen seen from Pennsylvania was one collected by C. S. Williamson, June 9, 1906, at Wawa, Delaware County. This specimen is in the Herbarium of the Philadelphia Academy of Science.



Fig. 63. *Panicum columbianum*.

44. *PANICUM COLUMBIANUM* Scribn.

Panicum psammophilum Nash.

A tufted light green or purplish perennial; culms 1.5-5 dm. high, erect or ascending, crisp-pubescent with ascending hairs; lower sheaths pubescent with ascending hairs, the upper ones nearly or quite glabrous, shorter than the internodes; ligule a ring of short hairs; blades 3-6 cm. long, 3-5 mm. wide, ascending, stiff, involute at the point, glabrous above or with a few long hairs at the base, more or less pubescent beneath; panicle 2.5-4 cm. long, nearly as wide; spikelets 1.5-1.6 mm. long, obovate, obtuse, pubescent; first glume about $1/3$ as long as the spikelet; second glume and sterile lemma nearly equal. Autumnal form much branched from the middle and upper nodes, spreading; winter rosettes of thick, firm blades. June-September.

This species is similar to *P. tsugetorum* from which it may be distinguished in its typical form by its smaller habit and shorter spikelets. It is found in fields and open woods from New England to Alabama, mostly near the coast.

Distribution in Pennsylvania.

Chester: Diamond Rock north of Paoli, Oct. 16, 1910, E. B. Bartram. Lehigh, Northampton, Philadelphia: Herb. Phila. Acad. Sc.

Fig. 64. *Panicum sphacrocarpon*.45. *PANICUM SPHAEROCARPON* Ell.

[Fig. 64.]

A light green tufted perennial; culms 2-5.5 dm. high, spreading, or erect, nodes slightly pubescent; sheaths usually a little shorter than the internodes, ciliate on the margin; ligule small or none; blades 6-10 cm. long, 7-14 mm. wide, upper surface rough, lower smooth, margins cartilaginous, scabrous and ciliate toward the base; panicles long-exserted, 5-10 cm. long, nearly as wide; spikelets 1.6-1.8 mm. long, nearly spherical and purplish at maturity, puberulent; first glume about $\frac{1}{4}$ as long as the spikelet, obtuse; second glume and sterile lemma about equal. July-September.

Found on sandy soil from Vermont to Florida, west to Illinois and Texas, and south through Mexico to Venezuela.

Distribution in Pennsylvania.

Berks: Sandy meadow on Nolde Estate about 5 miles from Reading, July 24, 1919, E. M. G. Bedford: Centerville, Sept. 3, 1919, O. E. J., Geo. B. Parker. Bucks, Chester: Porter's Flora. Delaware: Chester, July 22, 1920, E. M. G. Lancaster: Conewago, July 18, 1920, E. M. G. Luzerne: Porter's Flora. Monroe: Straudsbury, July 5, 1896, N. L. Britton. Montgomery: Porter's Flora. Northampton: Easton, 1893, Porter. Philadelphia: Porter's Flora; N. A. Species of *Panicum*.

Fig. 65. *Panicum polyanthes*.46. *PANICUM POLYANTHES* Schult.

[Fig. 65.]

Panicum multiflorum Ell. (not Poir)*Panicum microcarpon* Muhl. (1817 not 1816).*Panicum microcarpon isophyllum* Scribn.

A light green tufted perennial; culms 3-9 dm. high, erect; sheaths longer than the internodes below, smooth, ciliate on the margin, ligule small or wanting; blades thin, flat, 12-23 cm. long, 15-25 mm. wide; apex acuminate; base cordate-clasping; margin cartilaginous toward the base; panicle long-exserted, 8-25 cm. long, densely flowered, branches very slender; spikelets usually purplish, 1.5-1.6 mm. long, obovate on nearly round, puberulent, first glume about $\frac{1}{3}$ as long as the spikelet, obtuse; second glume and sterile lemma about equal. July-September.

This species resembles *Panicum sphacrocarpon* from which it may be distinguished by its taller and more leafy culms, wider leaves, and more narrow panicles. It is found in damp places along woods or thickets from N. Y. to Oklahoma, south to Georgia and Texas.

Distribution in Pennsylvania.

Bucks, Chester: Porter's Flora. Delaware: Tinicum, Sept. 6, 1906, Witmer Stone. Fayette: Ohiopyle, Aug. 18, 1918, E. M. G.; Sept. 1, 1901, J. A. S. Lancaster: 1885, Jas. Galen; July 2, 1864, Porter; Pequa, July 17, 1919, E. M. G. Monroe: Godfrey Ridge, Stroudsburg, Aug. 4, 1920, E. M. G., O. E. J. Perry: On Susquehanna, Porter's Flora. Philadelphia: Porter's Flora.

Fig. 66. *Panicum bicknellii*.47. *PANICUM BICKNELLII* Nash.

[Fig. 66.]

A perennial; culms erect, 3-5 dm. high, glabrous or slightly puberulent below, nodes glabrous or sparsely bearded; sheaths glabrous or the lower ones slightly pubescent; blades 8-15 cm. long, 3-8 mm. wide, uppermost longest, smooth on both surfaces, slightly ciliate at the base; panicle 5-8 cm. long, about $\frac{2}{3}$ as wide; spikelets 2.3-2.8 mm. long, glabrous or slightly pubescent; first glume and sterile lemma about equal. July-August.

Dry rocky woods from Connecticut to Missouri and southward.

Distribution in Pennsylvania.

Franklin: Slate hills near Chambersburg, June 12, 1899, Porter.

Fig. 67. *Panicum angustifolium*.48. *PANICUM ANGUSTIFOLIUM* Ell.

[Fig. 67.]

Slender erect perennial; culm 3-6 dm. high, appressed-pubescent below, glabrous toward the top, at first simple but branching later toward the top; nodes not bearded; sheaths glabrous or the lower ones pubescent; blades 8-15 cm. long, 4-8 mm. wide; panicle exserted, 4-10 cm. long, nearly as wide, loosely flowered, branches spreading or sometimes drooping; spikelets few, 2.5-2.8 mm. long; first glume about $\frac{1}{3}$ the length of the spikelet; second glume and sterile lemma equal, obtuse, pubescent; fruit minutely pubescent at the apex. June-August.

This species grows in dry sandy soil from Pennsylvania to Florida and westward to Texas. I have not seen any specimens from Penn-

sylvania. Hitchcock and Chase report it from "Bank of Schuylkill below Reading, 1849;" Thos. C. Porter, Herb. Phila. Acad. Sc.



Fig. 68. *Panicum boreale*.

49. **PANICUM BOREALE** Nash.

[Fig. 68.]

A perennial; culms tufted, slender, erect, 3-5 dm. high; nodes glabrous or sometimes with a few hairs; sheaths ciliate on the margin, glabrous, or the lower ones slightly pubescent; blades glabrous, sparsely ciliate at the base, 6-12 cm. long, 7-12 mm. wide; panicle 5-10 cm. long; spikelets 2-2.5 mm. long, subacute, pubescent; first glume about $\frac{1}{3}$ as long as the spikelet; second glume and sterile lemma subequal. June-July.

This species is very similar to *P. clutei* from which it may be distinguished by its glabrous nodes. The lower nodes are sometimes sparsely bearded which makes it difficult to distinguish from that species.

Distribution in Pennsylvania.

Monroe: Pocono Summit, Aug. 19, 1920, E. M. G., O. E. J., G. K. J.; Pocono Summit and Tobyhanna, Porter's Flora. Northampton: Porter's Flora.



Fig. 69. *Panicum ashei*.

50. **PANICUM ASHEI** Pearson.

[Fig. 69.]

A tufted perennial; culms 2.5-5 dm. high, erect, stiff, crisp-puberulent; sheaths puberulent and ciliate on the margin; blades 4-8 cm. long, 5-12 mm. wide, ciliate at the cordate base, glabrous; panicle 5-10 cm. long, nearly as wide, exserted, branches in fascicles, ascending; spikelets 2.4-2.7 mm. long (usually less than 2.5 mm.), pubescent, first glume about $\frac{1}{3}$ as long as the spikelet; second glume and sterile lemma about equal, obtuse. May-August.

Found in dry woods, Massachusetts to Florida west to Michigan, Missouri, and Mississippi. The species is very similar to *P. commutatum* Schult. from which it may be distinguished by its crisp puberulence. The Northampton County specimens listed below were both labeled *P. commutatum* Schult. They are rather intermediate forms but I think they fit more closely the description of *P. ashei* Pearson.

Distribution in Pennsylvania.

Cumberland: Doubling Gap, May 30, 1922, E. M. G. Dauphin: Manada Gap, June 10, 1922, E. M. G. Franklin: Chambersburg, 1898, Porter. Lancaster: McCall's Ferry, June 7, 1922, E. M. G. Northampton: Easton, June 14, 1896, Porter; June 18, 1896, A. A. Tyler. Perry: Losh's Run, June 21, 1923, E. M. G.

Fig. 70. *Panicum commutatum*.51. *PANICUM COMMUTATUM* Schult.

[Fig. 70.]

Panicum nervosum Muhl.

A tufted purple-tinged perennial; culms 4-7.5 dm. high, smooth, slightly puberulent at the nodes; sheaths shorter than the internodes, smooth, ciliate margin, puberulent ring at the summit, ligules not visible; blades firm, 5-12 cm. long, 12-25 mm. wide, smooth on both surfaces, sometimes slightly puberulent, margin ciliate at base; panicles 6-12 cm. long, about the same width, branches spreading; spikelets 2.6-2.8 mm. long, elliptic, obtuse, softly pubescent, first glume about $\frac{1}{4}$ as long as the spikelet; second glume and sterile lemma about equaling the fruit at maturity. Autumnal form erect and branching from the middle and upper nodes. June-August.

This species is similar to *P. ashei* but may be distinguished from that species by its wider leaves, larger spikelets and nearly or quite smooth character. It is found in dry woods and thickets from Massachusetts to Illinois and south to Florida and Texas.

Distribution in Pennsylvania.

Butler: Near Renfrew, June 19, 1920, E. M. G. Bucks: Porter's Flora. Dauphin: Manada Gap, Aug. 20, 1921, E. M. G. Fayette: Ohio-pyle, Ricker, N. A. Species of *Panicum*. Franklin: Porter's Flora. Lancaster: Porter's Flora; Herb. Phila. Acad. Sc. Montgomery: Herb. Phila. Acad. Sc. Northampton: Porter's Flora. Philadelphia, York: Herb. Phila. Acad. Sc.

12. *SYNTHERISMA* Walt.

Finger Grass. Crab Grass.
Digitaria Hall.

Annual grasses with branched stems, flat leaves, and spike-like one-sided racemes which are digitate, in whorls, or approximate at the end of the culm and branches. Spikelets 1-flowered, sessile or short-pedicelled, solitary or in 2's or 3's, in two rows, on one side of the narrow or winged rachis; glumes 1-3-nerved, the first sometimes minute or wanting; sterile lemma 5-nerved; fertile lemma leathery-indurated, with a hyaline margin not inrolled; palea similar in texture; grain free, enclosed in the lemma and palea

- Culms erect, branching at the base; rachis not winged.1. *S. filiforme*
 Culms decumbent, sometimes extensively creeping, branching throughout; rachis
 wing-margined.
 Foliage glabrous; fruit brown; first glume wanting2. *S. ischaemum*.
 Foliage pilose; fruit pale gray; first glume minute.3. *S. sanguinalis*.



Fig. 71. *Syntherisma filiforme* (Slender Finger Grass.)

1. **SYNTHERISMA FILIFORME** (L.) Nash.

[Fig. 71.]

Slender Finger Grass.
Panicum filiforme L.
Digitaria filiformis Koel.

A slender, usually tufted annual; culms erect, almost filiform, 2-7 dm. high; sheaths hirsute; blades 0.5-2 dm. long, 1-4 mm. wide, rough on upper surface, smooth below; racemes 1-5, 3-10 cm. long, slender, rachis not winged; spikelets 1.7 mm. long, pubescent, in pairs or in 3's, second and third on slender pedicels; first glume usually wanting, second glume shorter than the sterile lemma, fertile lemma brownish. July-Sept.

This species is found on dry sandy soil from New Hampshire to Michigan and southward to North Carolina and Oklahoma.

Distribution in Pennsylvania.

Bucks, Crawford: Porter's Flora. Chester: Herb. Phila. Acad. Sc. Dauphin: In cultivated field, late summer, 1921 E. M. G. Delaware; Sandy soil, Tinicum, Aug. 22, 1902, B. H. Smith. Lancaster, Philadelphia: Herb. Phila. Acad. Sc.



Fig. 72. *Syntherisma ischaemum* (Small Crab Grass).

2. **SYNTHERISMA ISCHAEMUM** (Schreb.) Nash.

[Fig. 72.]

Small Crab Grass
Panicum glabrum Gaud.
Syntherisma linearis Nash.
Syntherisma humifusum Rydb.
Digitaria humifusa Pers.

[Hubbard, Rhodora 18: 231. 1916.]

Culms much branched, ascending or nearly prostrate, often rooting at the nodes; sheaths smooth; blades 2-10 cm. long, 2-6 mm. wide, glabrous; racemes 2-6, 3-10 cm. long, digitate or close together at the top of the culm, rachis winged; spikelets in 2's or 3's on rounded pedicels, pubescent, 2-2.2 mm. long; first glume wanting, second glume and sterile lemma equal, fertile lemma dark brown. August-October.

This species is found in cultivated ground and waste places. It, like *S. sanguinalis*, is a weed. It probably is sometimes confused with that more common species, but may be distinguished from it by its glabrous leaves, brown fertile lemma, rounded pedicels and by the absence of the first glume which is present but very small in *S. sanguinalis*.

Distribution in Pennsylvania.

Allegheny: Hazlewood, Sept. 12, 1885, B. H. P. Chester, Delaware, Erie, Franklin: Porter's Flora. Lackawanna: Vacant Lot, Scranton, Aug. 26, 1920, E. M. G., O. E. J., G. K. J. Lancaster: Jas. Galen. Lehigh: Herb. Phila. Acad. Sc., Pretz. Luzerne: Porter's Flora. Northampton: Chestnut Hill, Easton, 1921, E. M. G. Philadelphia: Porter's Flora.



Fig. 73. *Syntherisma sanguinalis* (Large Crab Grass). A. Inflorescence; B. Spikelets.

3. SYNTERISMA SANGUINALIS (L.) Dulac.

[Fig. 73.]

Large Crab Grass. Finger Grass

Panicum sanguinale L.

Digitaria sanguinalis Scop.

Syntherisma praeceox Walt.

Paspalum sanguinale Lam.

Annual; culms erect or ascending from a decumbent or creeping base, often rooting at the lower nodes, 3-12 dm. long; sheaths more or less papillose-hirsute, at least the lower ones; blades 5-12 cm. long, 4-10 mm. wide, more or less pubescent; racemes 3-12, digitate or in close whorls at the top of the culm, 5-18 cm. long; spikelets in pairs on three-angled pedicels, 3-3.5 mm. long, appressed-pubescent, lower glume very minute, second $\frac{1}{3}$ to $\frac{1}{2}$ as long as the spikelet; fertile lemma pale gray. August-October.

This is a troublesome weed in lawns, being an annual it should not be allowed to seed. It is very common everywhere, and is found throughout North America except in the extreme north. It is naturalized from Europe.

Distribution in Pennsylvania.

Allegheny: Montrose, July 27, 1918, E. M. G.; Edgewood, Sept. 1917, E. M. G. Beaver: Near Beaver, 1885 (?), Hugo Andriesse. Bucks, Chester, Dauphin, Delaware, Erie: Porter's Flora. Fayette: Ohio, Oct. 20, 1921, J. A. S. Franklin: Porter's Flora. Fulton: Dane, Aug. 1917, E. M. G. Huntingdon: Porter's Flora. Lancaster: 1885, Jas. Galen. Northampton, Philadelphia: Porter's Flora.

13. ECHINOCHLOA Beauv.

Barnyard Grass.

[Wiegand, K. M. *Echinochloa* in North America. *Rhodora* 23: 49. 1921.]

Coarse annual grasses with compressed sheaths, long broad leaves and terminal panicles of stout one-sided branches. Spikelets 1-flowered, sometimes a staminate flower below the perfect one; glumes unequal spiny-hispid on the nerves, mucronate; sterile lemma similar, usually awned, its palea hyaline; fertile lemma and palea chartaceous, acuminate, margins of the lemma inrolled; grain free, enclosed in the lemma and palea.

Sheaths glabrous.

Second glume and sterile lemma with coarse stiff divergent trichomes, conspicuously pustular at the base1. *E. muricata*.

Second glume and sterile lemma with fine appressed trichomes, not pustular or only slightly so at the base2. *E. crusgalli*.

Sheaths, at least the lower ones, densely papillose-hirsute3. *E. walteri*.

[See *E. colonum* Page 88.]



Fig. 74. *Echinochloa muricata*. A. Inflorescence; B. Different views of a spikelet.

1. ECHINOCHLOA MURICATA (Michx.) Fernald.

[Fig. 74.]

[*Rhodora* 17: 105-107, 1915.]

Panicum muricatum Michx. Fl. Bor. Am. 1:47. 1803.

Panicum pungens Poir, Encyl. Suppl. IV, 273. 1816.

Panicum crusgalli var. *muricatum* Farwell.

[Mich. Acad. Sci. Rep. VI: 210, 1904.]

This species has been included in *Echinochloa crusgalli* (L.) Beauv. It is similar in every respect except as to the trichomes (coarse hairs) of the second glume and sterile lemma. In *E. crusgalli* (L.) Beauv. the second glume and sterile lemma bear appressed-ascending fine trichomes which are not thickened at the base or only slightly so. In *Echinochloa muricata* (Michx.) Fernald the trichomes on the second glume and sterile lemma are coarser, stiffer, and more divergent, with a conspicuous pustular swelling at the base. For more detailed information see Fernald in Rhodora l. c. The Pennsylvania specimens seem not to be very definite and constant in the characters that distinguish this species from *E. crusgalli*.

Distribution in Pennsylvania.

Chester: Herb. Phila. Acad. Sc. Lancaster: Pequea, Herb. Phila. Acad. Sc. Lehigh: Herb. Phila. Acad. Sc.



Fig. 75. *Echinochloa crusgalli* (Barnyard Grass).

2. ECHINOCHLOA CRUSGALLI (L.) Beauv.

[Fig. 75.]

Barnyard Grass. Cockspur Grass.

Panicum crusgalli L.

A coarse annual; culms stout, 3-18 dm. high, branching at the base, often spreading over the ground; *sheaths and blades smooth*, the latter 1.5-6 dm. long, 6-25 mm. wide; panicles 1-3 dm. long, composed of 5-15 erect, spreading or reflexed branches; spikelets green or purple, densely crowded in 3-4 rows along one side of the rachis, about 3 mm. long; glumes unequal, the second glume and sterile lemma bearing appressed fine trichomes, not thickened or only slightly so at the base, the lemma awned from the apex. The awnless form has been called *P. crusgalli* var. *muticum* Vasey. August-October.

This species is found in waste places, roadsides, and barnyards almost everywhere in the United States. It is of some value in parts of the south where by spontaneous growth it often yields a fair hay crop. The grain of a form growing in Mexico is used by the Indians for food. Where it is troublesome as a weed it may be eradicated by preventing the formation of seeds. As it is so common throughout the state, the distribution for Pennsylvania is not given.

ECHINOCHLOA FRUMENTACEA (Roxb.) Link.

Billion-Dollar Grass.

This species differs from *E. crusgalli* in its shorter, more compact, somewhat incurved racemes and its nearly awnless spikelets. It has been introduced from Asia where the seeds are used for food. It has been recommended as a forage plant and is being grown by a few farmers in parts of the state (Tioga and Potter counties). Hitchcock (Genera of Grasses, p. 239) says, "It has some forage value, but requires considerable moisture to produce abundantly, and is rather too succulent to make good hay." The field observed during the summer of 1920 in Tioga County yielded a very heavy crop.

Fig. 76. *Echinochloa walteri* (Salt Marsh Grass).

3. ECHINOCHLOA WALTERI (Pursh) Nash.

[Fig. 76.]

Salt-marsh Cockspur.

Panicum hirtellum Walt.*Panicum Walteri* Pursh.*Panicum hispidum* Muhl.*Panicum crusgalli* var. *hispidum* Torr.

A robust annual; culms branching at the base, smooth, 5 dm. to nearly 2 m. high; sheaths, at least the lower ones, *coarsely papillose-hispid*; blades 30 cm. or more long, 12-25 mm. wide, scabrous; panicle 1.5-4.5 dm. long, nodding, branches usually ascending; spikelets about 3 mm. long, purplish, crowded in 2-4 rows on one side of the hispid rachis; first glume small, sharp pointed or short awned, second glume and sterile lemma very long awned. August-October.

This species is found in marshes and ditches, chiefly near the coast from New Hampshire to Florida and in Ontario and Illinois. It may easily be distinguished from our other species by its hispid sheaths and by the long-awned second glume and very long-awned sterile lemma.

Distribution in Pennsylvania.

It is rare in Pennsylvania having been reported only from the eastern section, from Philadelphia by Porter and from Bucks County. Bucks: North of Tullytown, Aug. 28, 1922, E. M. G.

NOTE. *Echinochloa colonum* (L.) Link was collected on ballast at Girard Point, Philadelphia, by Martindale in 1879. This is a plant confined to a warmer climate than that of Pennsylvania and will probably be found only as a transient. See Hitchcock, A. S., Revision of North Amer. Grasses. Contributions U. S. Nat. Herb. 22, pt. 3. 1920.

14. PASPALUM L.

Perennial grasses with one to several one-sided, spike-like racemes which are single, in pairs or panicles at the summit of the culm and branches. Spikelets 1-flowered, oblong to orbicular, plano-convex, nearly sessile, solitary or in pairs, in 2 rows on one side of a narrow or dilated rachis, placed with the back of the fertile lemma toward the rachis; glumes very unequal or the first normally wanting; lemma and palea indurated, margins of the lemma inrolled.

Racemes 1-several, 1 terminal and often 1 or more lateral.

Rachis broadly winged, partly infolding the spikelet; plants subaquatic. 1. *P. dissectum*.

Rachis not winged; plants terrestrial.

Spikelets not over 2.2 mm. long, in pairs, appearing as if in 3 or 4 rows.

Spikelets 1.6 mm. long or less.....2. *P. setaceum*.

Spikelets about 2 mm. long.

Blades linear, 3-5 mm. wide, usually rather densely pilose. 3. *P. pubescens*.

Blades wider toward the middle, 6-10 mm. wide, usually sparsely pilose. 4. *P. muhlenbergia*.

Spikelets 2.5-3.2 mm. long, singly in 2 rows.

Sheaths and blades pilose, spikelets 2.5-2.75 mm. long.5. *P. longipilum*.

Sheaths and blades glabrous or sparingly pilose

Spikelets not over 2.8 mm. long, broadly oval; the panicle much exceeding the leaf blades.6. *P. laeve*.

Spikelets 3-3.2 mm. long, suborbicular; leaf blades reaching the base of the panicle or overtopping it.7. *P. circularc*.

Racemes a pair at the summit of the culm (rarely in 3's or with an additional one a short distance below.8. *P. distichum*.



Fig. 77. *Paspalum dissectum*.

1. *PASPALUM DISSECTUM* L.

[Fig. 77.]

Paspalum membranaceum Walt.*Paspalum walterianum* Schultes.

Culms branched, creeping at the base and often rooting at the nodes, the flowering ends erect or ascending; sheaths glabrous, slightly inflated; blades 1-5 cm. long, smooth; racemes 3-7, alternate, 1-2.5 cm. long, the lower ones usually partly included in the sheath, rachis 2-3 mm. wide, green and membranous, partly enclosing the spikelets by its infolding margins; spikelets 2-2.3 mm. long, oval, glabrous. Sept.

This is a semiaquatic plant found in wet places or sometimes in water from New Jersey to Florida and Texas. No specimens of this species from Pennsylvania have been seen and the only known record for it in the state is the one given by Porter from Philadelphia.



Fig. 78. *Paspalum setaceum*. A. Inflorescence; B, C. Two views of a spikelet.

2. *PASPALUM SETACEUM* Michx.

[Fig. 78.]

Culms slender, erect or ascending, 2-7 dm. high, smooth; basal sheaths densely pubescent, upper ones only on the margin; blades 3-18 cm. long, 2-6 mm. wide, densely pubescent on both surfaces; racemes usually single, 4-10 cm. long; spikelets either single or in pairs on short puberulent pedicels, about 1.5 mm. long, finely pubescent and glandular spotted. Aug.-Oct.

This species is found in dry sandy soil in the southern states north to New Jersey. Many specimens which have been identified as *P. setaceum* are found to be *P. pubescens*. The spikelets of *P. pubescens* are about 2 mm. long and smooth while those of *P. setaceum* are not over 1.6 mm. long and finely pubescent glandular. Appears to be a southern species, probably found only in the southeastern part of the state.

Distribution in Pennsylvania.

Philadelphia: Fairmount Park, Herb. Phila. Acad. Sc., Britton; also a specimen by A. H. Smith.

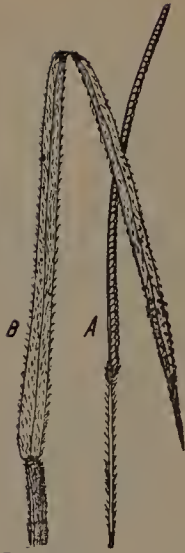


Fig. 79. *Paspalum pubescens*. A. Inflorescence; B. Leaf.

3. PASPALUM PUBESCENS Muhl.

[Fig. 79]

Culms 4-8 dm. high, slender, erect, densely pubescent below the racemes; sheaths smooth, sometimes pubescent on the margin and upper part; blades 1-2 dm. long, 3-6 mm. wide, long-pubescent on both surfaces; racemes one, rarely two on the main culm, 6-12 cm. long; spikelets in pairs, about 2 mm. long, glabrous. August-September.

This species is found in fields and dry woods from New York, Pennsylvania and New Jersey to Texas.

Distribution in Pennsylvania.

Chester and Delaware: Flora of Phila. and vicinity. Fulton: Dane, Aug. 25, 1917, E. M. G. Lancaster: 1885, Jas. Galen. Lehigh: A. F. K. Krout. Montgomery: Porter's Flora.



Fig. 80. *Paspalum muhlenbergii*. A. Inflorescence; B. Leaf.

4. *PASPALUM MUHLENBERGII* Nash.

[Fig. 80]

Culms tufted, branching, erect at first, later spreading or reclining, glabrous sheaths pubescent or sometimes only on the margin; blades not over 2 dm. long, 7-10 mm. wide, long-pubescent on both surfaces, wider near the middle, ciliate on the margin; racemes 1-2; spikelets 2 mm. long, sometimes slightly longer, in pairs, smooth. August-October.

This species is found in sandy soil of open woods and old fields from New Hampshire to Missouri and southward to Florida and Texas. It is similar to *Paspalum pubescens* from which it may be distinguished by its wider leaves (6-10 mm.) which are widest in the middle and not uniformly wide (linear) like those of *Paspalum pubescens* (3-5 mm.).

Distribution in Pennsylvania.

Beaver: Dry sterile meadow, Raccoon Creek, Oct. 6, 1918, Jno. Bright. Bucks, Chester, Delaware: Tinicum, Porter's Flora. Franklin: Porter's Flora. Lancaster: Flora of Lancaster County. Northampton, Philadelphia, York: Porter's Flora.

5. *PASPALUM LONGIPILUM* Nash.

Long-haired Paspalum.

Paspalum plenipilum Nash.*Paspalum praelongum* Nash.*Paspalum longipilum* Nash. Bull. N. Y. Bot. Garden 1: 435. 1900.

Culms usually tufted, 3-9 dm. high, erect, smooth; sheaths densely hirsute with long weak hairs; ligule scarious, 1.5-2 mm. long; blades firm, erect, lower ones 1.5-2 dm. long, 7-10 mm. wide, glabrous beneath, densely pubescent with long, rather weak spreading hairs on the upper surface, uppermost blade very short; racemes 2-4, rarely single, spreading or ascending, 5-7 cm. long, rachis winged, 1/2-2/3 as wide as the spikelets; spikelets singly disposed, broadly oval, about 2.75 mm. long, 2.25 mm. wide.

This species is found along the Atlantic Coastal Plain. The type specimen was collected on sandy soil on the peninsula of Florida. It is similar to *Paspalum laeve* Michx., but may be distinguished from that species by the densely hirsute sheath and upper surface of leaf-blade.

Distribution in Pennsylvania.

This species is reported from the eastern part of the state. In the Herbarium of the Philadelphia Academy of Science there are several of Porter's specimens which had originally been referred to other species. These specimens are from Northumberland Co. and Lancaster Co. There is also a specimen from Montgomery Co., Oak Lane Station, near Philadelphia, collected by Bayard Long, Oct. 1, 1909.

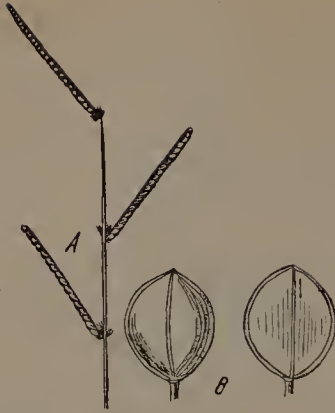


Fig. 81. *Paspalum laeve* (Field Paspalum). A. Inflorescence; B. Two views of a spikelet.

6. PASPALUM LAEVE Michx.

[Fig. 81]

Field Paspalum.

Paspalum australe Nash.

Paspalum angustifolium LeConte.

Culms erect, spreading or sometimes prostrate, 3-6 dm. high, smooth; sheaths smooth or slightly pubescent, sometimes ciliate on the margin; blades smooth on the upper surface, sometimes pubescent especially toward the base, 1-2 dm. long, 4-8 mm. wide; racemes 2-6, usually about 3, 3-5 cm. long, rarely longer, long hairs in the axils; spikelets 2.5-2.8 mm. long. August-September.

This species is found in open ground and along roadsides in the southern states and north to New Jersey. Its distribution in the state cannot be given with certainty as it has been confused with *P. circulare*, from which it may be distinguished by the racemes and by its shorter spikelets which are not over 2.8 mm. long while those of *P. circulare* are not less than 3 mm. long. The racemes too are shorter than those of *P. circulare*. Many specimens in the Herbarium prove to be *P. circulare*.

Distribution in Pennsylvania.

Chester, Delaware, Franklin, Lancaster, Lebanon, Montgomery, Northampton, Philadelphia, York: Porter's Flora.

7. PASPALUM CIRCULARE Nash.

[Fig. 82.]

Culms 5-10 dm. high; sheaths papillose-hirsute with spreading or ascending hairs; blades 2-3 dm. long, 5-8 mm. wide, reaching the panicle or overtopping it, sparsely hirsute on the upper surface, glabrous or with a few hairs beneath; racemes 2-4, erect or ascending, 6-10 cm. long; spikelets singly disposed, orbicular, 3-3.2 mm. long. July-September.

This species is found in moist fields from Connecticut to Missouri and South Carolina and Texas. Of the three closely related species (*Paspalum longipilum*, *P. circulare*, and *P. laeve*) *P. circulare* is the one commonly found in Pennsylvania. It has not, however, been reported from the western part of the state.

Distribution in Pennsylvania.

Berks, Bucks: Herb. Phila. Acad. Sc. Chester: Aug. 5, 1909, Bayard Long. Delaware: Bartram, Smith, Herb. Phila. Acad. Sc. Lan-

caster: Carter, Porter, Herb. Phila. Acad. Sc. Lebanon: Herb. Phila. Acad. Sc. Lehigh: Pretz, Herb. Phila. Acad. Sc. Montgomery: Sept. 26, 1908, Long. Philadelphia. Herb. Phila. Acad. Sc. York: MacElwee, Herb. Phila. Acad. Sc.



Fig. 82. *Paspalum circulare*.



Fig. 83. *Paspalum distichum*. A. Whole plant; B. Two views of a spikelet.

8. PASPALUM DISTICHUM L.

[Fig. 83]

Digitaria paspaloides Michx.

Paspalum michauxianum Kunth.

Culms creeping and rooting at the nodes, becoming erect at the end, 1-6 dm. long; sheaths smooth, sometimes ciliate on the margin and at the summit; blades 4-12 cm. long, 2-5 mm. wide; 2 racemes (occasionally 3), 3-5 cm. long; spikelets 2.5-3 mm. long, singly disposed, ovate, acute, sparsely and minutely pubescent; first glume sometimes present. June-October.

This grass is found in ditches and on muddy or sandy shores from Virginia and Missouri to Florida and Texas and southern California, northward on the Pacific coast to Oregon. "Widely distributed in tropical and subtropical regions of both hemispheres." It is a good grass for holding the sand along river banks and ponds and on account of its somewhat succulent stems and tender leaves makes good grazing.

Pennsylvania is really out of range of this species. It is probably only a transient, having been reported so far as known, only from Philadelphia, where it was found growing on ballast, Sept. 25, 1864, by Porter and others.

15. ZIZANIA L.

Wild Rice. Water Rice. Indian Rice.

Tall monoecious aquatic grasses with long flat leaves and large terminal panicles, the upper part bearing pistillate spikelets, the lower part staminate. The upper or pistillate spikelets linear, awned, on club-shaped pedicels on erect branches. glumes none; lemma awned and closely clasping the 3-nerved palea by a pair of strong lateral nerves. The lower or staminate spikelet lanceolate, falling off early, borne on spreading branches; first glume 5-nerved, second 3-nerved; stamens 6; grain closely enveloped in the lemma and palea.

Leaves less than 1 cm. wide, pistillate portion of panicle rather narrow, plant only about 1 m. high, rather slender1. *Z. aquatica* L.

Leaves broad 1.5-4 cm. wide, pistillate portion of panicle wide and spreading. plant 2-3 m. high, very robust,2. *Z. palustris* L.

1. ZIZANIA AQUATICA L.

Wild Rice. Indian Rice.

Culms erect about 1 m. high, smooth; sheath loose, glabrous; ligule membranous; blade 1-3 dm. long, less than 1 cm. wide, scabrous; panicles about 3 dm. long, upper portion with erect branches, pistillate; lower portion more spreading, staminate, much narrower than in *Z. palustris*; staminate spikelets about 1 cm. long, pistillate spikelets 12-20 mm. long, glumes of pistillate spikelet wanting, lemma long awned; first glumes of the staminate spikelet 5-nerved, second one 3-nerved. June-August.

This species is found in swamps and shallow water in north-eastern United States and Canada. On account of its being considered synonymous with *Z. palustris* by some it is impossible to give with certainty the distribution of this species, as well as of *Z. palustris*, in the state. *Z. aquatica* L. was collected on Presque Isle, Erie County, Aug. 12, 1879 by Guttenberg (specimen in the Herb. of the Carnegie Museum), also at the same place by the author, Aug. 1919. The species is probably limited to this extreme north-western point of the State, a place where northern plants are frequently found.

2. ZIZANIA PALUSTRIS L.

Wild Rice. Indian Rice.

Zizania aquatica [of Authors not L.]

Annual; culms erect 2-3 m. high; sheath loose and glabrous; ligule membranous; leaves flat, 5-10 dm. long, 1.5-4 cm. wide; panicle 3-6 dm. long, upper portion with erect branches, pistillate; lower portion more spreading and staminate; staminate spikelets 6-12 mm. long, pistillate 8-24 mm. long, glumes of pistillate spikelet wanting; lemma long awned; first glume of the staminate spikelet 5-nerved, second one 3-nerved. June-August.

This grass is found in swamps and shallow water in the eastern and middle states. It is the species commonly found in Pennsylvania. Its distribution in the State cannot be listed with certainty as it is considered synonymous with *Z. aquatica* L. by some authors. It is very common about Chester, Delaware Co. The grain of this species as well as that of *Z. aquatica* L. is nutritious and was used for food by the Indians. It also furnished food for water fowls and other birds.



Fig. 84. *Zizania palustris* (Wild Rice). A. Inflorescence; B. Pistillate spikelet; C. Grain; D. Staminate spikelet.

[Fig. 84]

[See McAtee, Propagation of Wild-duck Foods. Bull. 465. U. S. Dept. of Agr., 1917.]

Distribution in Pennsylvania.

Bucks: Tulleytown, Aug. 7, 1899, C. D. Fretz. Chester: Porter's Flora. Delaware: Chester, Aug., 1901, Brown; Chester and Eddystone, July 22, 1920, E. M. G. Erie: Porter's Flora. (Probably *Z. aquatica*). Lancaster: Herb. Phila. Acad. Sc. Philadelphia: 1898, Krout, Herb. Phila. Acad. Sc. York: Porter's Flora.

16. HOMALOCENCHRUS Mieg.

White Grass. Cut Grass.

Leersia Swartz.

Perennial marsh grasses with flat rough cutting leaves and racemes of imbricated spikelets aranged in open panicles. Spikelets 1-flowered, strongly flattened laterally, those of the open part of the panicle usually sterile, those inclosed in the sheath cleistogamous and fruitful; glumes none; lemma boat-shaped, firm, awnless, clasping the palea by a pair of strong marginal nerves; palea similar in texture, narrower, 1-nerved; stamens 1-6; grain ovoid, free.

Spikelets 2.5-3.5 mm. long; branches single, spikelet-bearing toward the end
1. *H. virginicus*.
Spikelets 4-5 mm. long; branches clustered, spikelet-bearing from below the
middle 2. *H. oryzoides*.



Fig. 85. *Homalocenchrus virginicus* (White Grass). A. Inflorescence; B. Spikelet.

1. HOMALOCENCHRUS VIRGINICUS (Willd.) Britton.

[Fig. 85]

White Grass.

Leersia virginica Willd.

Culms 3-9 dm. high, slender, weak, branched, ascending from a scaly, clustered rootstock; sheaths smooth; blades 5-15 cm. long, 2-6 mm. wide, scabrous; panicles simple, 7-20 cm. long, branches spreading, spikelet bearing toward the end, lateral panicles smaller; spikelets 2.5-3.5 mm. long; glumes wanting; lemma hispid on the keel; stamens 1 or 2.

This species is found in wet woods and swamps and along streams from Maine to Ontario and southward.

Distribution in Pennsylvania.

Allegheny: Bailiff Farm, Glenshaw, Sept. 1918, O. E. J. Bedford: Centerville, Sept. 13, 1919, O. E. J. Bucks, Chester: Porter's Flora. Clarion: Clarion, Sept. 4, 1921, O. E. J. Crawford: Hartstown, Sept. 13, 1919, E. M. G. Dauphin: Harrisburg, Aug. 29, 1920, E. M. G. Delaware, Erie, Franklin, Huntingdon: Porter's Flora. Lancaster: 1884, Jas. Galen. Lycoming: Williamsport, Aug. 24, 1919, E. M. G. Monroe: Porter's Flora. Northampton: On the Delaware, Easton, Sept. 7, 1899, Porter. Philadelphia: Porter's Flora. Somerset: Shanksville, Aug. 21, 1876, B. H. P. York: Porter's Flora.

2. HOMALOCENCHRUS ORYZOIDES (L.) Poll.

[Fig. 86]

Rice Cut Grass.

Phalaris oryzoides L.

Leersia oryzoides Swartz.

Culms rather stout, 3-12 dm. high, branched, smooth, nodes pubescent, ascending, from a decumbent base with a slender rootstock; sheaths slightly rough; blades 7-25 cm. long, 4-10 mm. wide, rough; terminal panicles 10-25 cm. long, lax,

branches more or less spreading, spikelet bearing from below the middle, lateral panicles shorter and usually more or less included in the sheaths; spikelets 4-5 mm. long; glumes wanting; lemma hispid, ciliate on the keel; stamens 3. August-September.



Fig. 86. *Homalocenchrus oryzoides* (Rice Cut Grass). A. Inflorescence; B. Spikelets.

This grass is very common along streams and ditches and in wet swampy places from Newfoundland to Ontario and southward. The edge of the leaf has very fine teeth which make it very tough and sharp, sometimes cutting the skin when one attempts to pull it up, hence its common name "cut-grass."

Distribution in Pennsylvania.

Allegheny: Logan's Ferry, Sept. 23, 1916, O. E. J. Bucks, Chester: Porter's Flora. Crawford: Hartstown, Sept. 13, 1919, E. M. G. Dauphin: Harrisburg, Aug. 29, 1920, E. M. G. Delaware, Erie: Porter's Flora. Fayette: Ohiopyle, Aug. 18, 1918, E. M. G.; Sept. 10, 1906, O. E. J. Franklin: Porter's Flora. Fulton: Dane, Aug. 25, 1917, E. M. G. Jefferson: Porter's Flora. Lancaster: 1884, Jas. Galen. Luzerne: Porter's Flora. Mercer: Sharon, Aug., 1886, E. T. Aschman. Monroe: Porter's Flora. Northampton: Easton, Sept. 5, 1898, Porter. Philadelphia, Pike: Porter's Flora. Somerset: Stoystown, 1874, 1885. Warren: North Warren, Aug. 8, 1919, E. M. G. Westmoreland: Ligonier, Aug. 24, 1918, E. M. G.

17. PHALARIS L.

Canary Grass.

Annual or perennial grasses with flat leaves and spike-like capitate or narrow panicles. Spikelets crowded, 1-flowered, laterally flattened; glumes equal, boat-shaped, much longer than the florets; sterile lemmas 2, very small, appearing like hairy scales attached to the fertile floret; fertile lemma hard and shining; palea faintly 2-nerved; grain free, inclosed in the lemma and palea.

Annuals; glumes winged on the back; panicle short ovate spike or head.

1. *P. canariensis*.

Perennials; glumes not winged; panicle narrow but not a dense spike or head.

2. *P. arundinacea*.



Fig. 87. *Phalaris canariensis* (Canary Grass). A. Spike-like Inflorescence; B. Spikelet.

1. PHALARIS CANARIENSIS L.

[Fig. 87]

Canary Grass.

An annual; culms 3-8 dm. high, erect, usually simple, glabrous; lower sheaths overlapping, slightly rough; ligule membranous, about 2 mm. long; blades 5-30 cm. long, 4-12 mm. wide, very scabrous; panicles spike-like, dense, oval, 2-3 cm. long, about 1/2 as wide; spikelets broadly obovate, 5-8 mm. long; glumes equal, boat shaped, much larger than the floret, white with green veins; two small scales (sterile lemmas) at the base of the fertile floret; lemma pubescent with appressed silky hairs. July-August.

This grass is a native of Europe. It has not become very thoroughly established in the United States, but may be found in waste places from Nova Scotia to Ontario and southward to Missouri and Colorado. The grain is the common commercial food for canary birds. It can easily be distinguished by its whitish heads which show distinctly the green veins of the glumes.

Distribution in Pennsylvania.

Allegheny: On cinder pile, Swissvale, July 26, 1918, E. M. G.; Allegheny City, in rubbish along river above Chestnut St., Sept. 1886, J. A. S. Lancaster: Porter's Flora. Lackawanna: Scranton, Flora of Northwestern Pennsylvania. Northampton, Philadelphia: Porter's Flora.



Fig. 88. *Phalaris arundinacea* (Reed Canary Grass). A. Inflorescence; B. Spikelet; C. Floret.

2. PHALARIS ARUNDINACEA L.

[Fig. 88]

Reed Canary Grass.

A perennial; with long rootstocks; culms 6-15 dm. high, smooth; sheaths loose, smooth; ligule 2-6 mm. long, membranous; blade 8-25 cm. long, 6-15 mm. wide, scabrous; panicles 6-18 cm. long, dense; spikelets lanceolate, about 5 mm. long, whitish; glumes scabrous, 3-nerved; sterile lemmas at the base of the floret reduced to minute hairy scales; lemma about $3/4$ as long as the spikelet, appressed-pubescent. June-August.

This grass is found in moist or wet soil from Nova Scotia to British Columbia and southward to New Jersey and Colorado. Common in Pennsylvania in wet places in meadows, around ponds, and along streams. It is a good forage plant for such locations. The variety *picta* L., which has leaves striped with white is the Ribbon Grass familiar as an ornamental plant in gardens.

Distribution in Pennsylvania.

Allegheny: Glenshaw, July 18, 1918, E. M. G.; Allegheny City, June 2, 1886, B. H. P. Beaver: Freedom, July 1885, J. A. S. Bucks, Chester, Delaware, Erie, Huntingdon, Lancaster, Luzerne, Monroe, Northampton, Philadelphia: Porter's Flora. Somerset: Stoystown, 1885, 1877, 1879, B. H. P. Susquehanna: Porter's Flora. Washington: Riverview, 1919, E. M. G.

18. ANTHOXANTHUM L.

Sweet-scented annuals or perennials with flat leaves and narrow spike-like panicles. Spikelets 1-flowered, narrow, somewhat flattened; glumes unequal, acute or short-awned; sterile lemmas 2, 2-lobed, longer than the fertile floret, awned on the back; fertile lemma truncate, awnless; palea faintly 1-nerved; stamens 2; grain free, enclosed in the lemma and palea.

Annuals; culms branched; spikelets 5-7 mm. long; panicles 1-4 cm. long.
 1. *A. aristatum*.
 Perennial; culms simple; spikelets 8-10 mm. long; panicles 3-8 cm. long.
 2. *A. odoratum*

1. ANTHOXANTHUM ARISTATUM Boiss.

Anthoxanthum puelii Lec. and Lamotte.

This species is a smaller plant than *A. odoratum*, with a shorter panicle (1-4 cm.) and a culm which branches from the nodes; the awn is longer and extends about 1 cm. beyond the glumes.

It is found in dry fields from New England to Ontario and Pennsylvania. It is not common in Pennsylvania. A specimen was sent to the Pennsylvania Bureau of Plant Industry for identification in August, 1920, which was collected on Jeffrey Farm, Forest Co., Pa., by A. R. Hillard. The appearance of the plant is different from that of *A. odoratum*. It branches rather extensively from the nodes and the panicles are less than 2 cm. long. So far as known this is the only report from the State.

2. ANTHOXANTHUM ODORATUM L.

[Fig. 89]

Sweet Vernal Grass.

Sweet scented perennial; culms slender, erect, smooth, usually simple, 2-6 dm. high; sheaths shorter than the internodes; ligule 2-5 mm. long, membranous; blades 3-15 cm. long, scabrous above or nearly glabrous; panicle 3-8 cm. long, spike-like; spikelets brownish green, 8-10 mm. long, crowded; first glume one-nerved,

about half as long as the second which has three nerves; first sterile lemma short awned from about the middle, the second bearing from near its base an awn about twice its own length; fertile lemma obtuse or rounded. May-July.



Fig. 89. *Anthoxanthum odoratum* (Sweet Vernal Grass). A. Inflorescence; B. Spikelet; C. Floret.

Found in meadows and pastures throughout nearly all of N. A. It is of little value as a forage plant although it is sometimes cultivated for the sweet odor which it imparts to the hay.

Distribution in Pennsylvania.

Allegheny, Edgewood, June 25, 1917, E. M. G.; Stanton Ave., Pittsburgh, May 20, 1902, J. A. S. Berks, Blair, Bucks: Porter's Flora, Cambria: Johnstown, May 31, 1874, J. A. S. Chester: Porter's Flora. Crawford: Hartstown, Aug. 5, 1918, E. M. G.; June 7, 1904, O. E. J. Delaware, Erie: Porter's Flora. Fayette: Ohiopyle, Sept. 1, 1901, J. A. S.; May 14, 1905, O. E. J. Franklin: Porter's Flora. Lancaster: Rawlinsville, June, 1883, Jas. Galen. Monroe: Tobyhanna, Aug. 13, 1920, E. M. G., O. E. J. Philadelphia, Somerset: Porter's Flora. Wayne: Moosic Mt., Waymart, Aug. 23, 1920, E. M. G., O. E. J.

19. MILIUM L.

Millet Grass.

Our species perennial with flat leaves and open, lax panicles. Spikelets 1-flowered, glumes equal; lemma membranous at first, finally indurated, shining, margins inrolled; palea similar and about the same length; grain free, inclosed in the rigid lemma and palea.

MILIUM EFFUSUM L.

[Fig. 90]

Tall Millet Grass.

Culms light green, 1-1.5 m. high, rather weak but erect, smooth, simple; sheaths shorter than the internodes, smooth; ligule 3-6 mm. long, membranous, erose-dentate; blades 1-3 dm. long, 8-15 mm. wide, smooth or slightly scabrous; panicles 1-2 dm. long, lax, slender branches in pairs or fascicles, somewhat flexuous, spreading or drooping, spikelet-bearing from about the middle; spikelets 3-3.5 mm. long; glumes equal, minutely scabrous; lemma slightly shorter than the glumes, whitish margins inrolled over a similar palea. May-July.



Fig. 90. *Milium effusum* (Tall Millet Grass). A. Inflorescence; B. Spikelet.

This species is found in rich, moist, cool woods from Nova Scotia to Ontario and southward to Pennsylvania and Illinois.

Distribution in Pennsylvania.

Chester, Clarion: Porter's Flora. Crawford: Hartstown, May 3, 1919, E. M. G. Erie, Mercer: Porter's Flora. Somerset: Stoystown, No Date, B. H. P. Sullivan, Wayne: Porter's Flora.

20. ARISTIDA L.

Needle Grass.

Tufted annual or perennial grasses with narrow, often involute-setaceous leaves and usually loose narrow panicles. Spikelets 1-flowered; glumes unequal, narrow acute or acuminate; lemma somewhat indurated, convolute, terminated in a three-parted awn (lateral branches rarely wanting); palea thin, 2-nerved; grain free, tightly enclosed in the lemma.

Plants perennial; spikelets crowded on the short erect branches of a narrow panicle 1. *A. purpurascens*.

Plants annual; spikelets not crowded; panicle nearly simple.
Middle awn coiled at the base at maturity. 2. *A. dichotoma*.
Middle awn not coiled.

Lateral awn 2-6 mm. long, much shorter than the middle one. ... 3. *A. gracilis*.

Lateral awn 3.5-7 cm. long, not much shorter than the middle one. 4. *A. oligantha*.

1. ARISTIDA PURPURASCENS Poir.

[Fig. 91]

Slender tufted perennial; culms glabrous, little branched, 3-6 dm. high; sheaths smooth; blades 1-2 dm. long, 1-4 mm. wide, usually involute toward the apex; pa-

nicle spike-like, slender, purplish, about $1/2$ the length of the plant; glumes slightly unequal, scabrous, pointed, 10-12 mm. long; lemma 6-7 mm. long, awns divergent, not twisted, 1.5-3 cm. long, the middle one slightly the longest. September-October.



Fig. 91. *Aristida purpurascens*.

Found growing on sandy or gravelly soil. Massachusetts to Minnesota and southward.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Chester, Delaware: Herb. Phila. Acad. Sc. Franklin, Lancaster: Porter's Flora. Northampton: Easton, Aug. 27, 1896, A. A. Tyler.



Fig. 92. *Aristida dichotoma* (Poverty Grass). A. Inflorescence, B. Spikelet.

2. ARISTIDA DICHOTOMA Michx.

[Fig. 92]

Poverty Grass.

A small much branched annual; culms tufted, wiry, much branched at the base and usually forking at each node, sometimes nearly simple, 1-6 dm. high; sheath loose; ligule a minute fringe of hairs; blade narrow involute, 2-12 cm. long; panicles simple, spike-like, 2-8 cm. long, the lateral ones often partly enclosed in the sheaths; spikelets 6-8 mm. long; glumes nearly equal, linear, 7-8 mm. long, sharp pointed; lemma about 6 mm. long, three-awned, the lateral awn short and erect, the middle one 3-6 mm. long, bent at right angle to the lemma, coiled at the base at maturity. August-October.

Found in dry sandy or gravelly soil from Maine to Nebraska, south to Georgia and Texas.

Distribution in Pennsylvania.

Bucks: Andalusia, Aug. 28, 1922, E. M. G. Chester: Porter's Flora. Cumberland: Hunter's Run, Sept. 2, 1921, E. M. G. Delaware, Franklin: Porter's Flora. Lackawanna: Scranton, Aug. 26, 1920, E. M. G., O. E. J. Lancaster: Martie Hills, 1886, James Galen. Lehigh: Oct. 20, 1875, T. J. Oberly. Mercer: Dry Fields, Sharon, June, 1886, F. T. Aschman. Montgomery, Northampton, York: Porter's Flora.

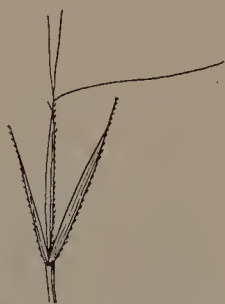


Fig. 93. *Aristida gracilis* (Slender Needle Grass).

3. ARISTIDA GRACILIS Ell.

[Fig. 93]

Slender Needle Grass.

Annual; culm slender, smooth, in tufts or solitary, simple or branched, 1.5-5 dm. high; sheaths shorter than the internodes, smooth; blades narrow, usually involute when dry; inflorescence a slender raceme or narrow panicle; spikelets distant below, often crowded above, about 6 mm. long; glumes unequal, the upper one equaling the floret; lemma about 6 mm. long, usually mottled, 3-awned, middle awn horizontal, 8-15 mm. long, lateral awns erect, 2-6 mm. long. August-September.

Dry, sandy soil from Nova Scotia to Missouri and southward.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Chester, Delaware: Porter's Flora; Herb. Phila. Acad. Sc. Franklin, Lancaster, Montgomery, Northampton: Porter's Flora. Philadelphia: Porter's Flora; Herb. Phila. Acad. Sc.

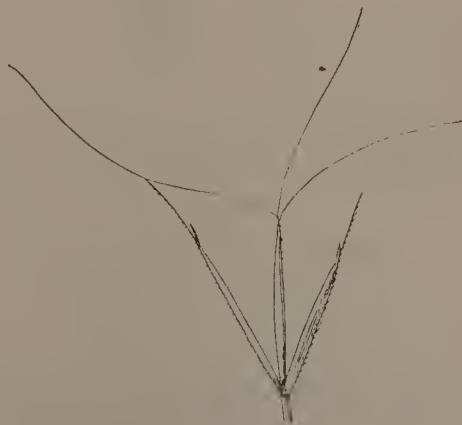


Fig. 94. *Aristida oligantha*.

4. *ARISTIDA OLIGANTHA* Michx.

[Fig. 94]

A tufted annual; culms slender, wiry, much branched, 3-6 dm. high; sheaths loose, smooth; blades long, slender, involute; raceme or panicle few flowered; spikelets 18-22 mm. long, exclusive of the awns; glumes unequal, awn-pointed; lemma 17-22 mm. long, scabrous above, triple-awned, awns nearly equal, divergent, 3.5-7 cm. long. July-October.

Found in dry, sterile soil; from New Jersey to Nebraska and southward, also in Oregon and California.

Distribution in Pennsylvania.

Adams: Battlefield, Gettysburg, Oct. 25, 1921, E. M. G. Allegheny: Schenly Park, golf ground, Oct. 15, 1919, O. E. J. Chester, Delaware: Herb. Phila. Acad. Sc. Delaware: Porter's Flora. Philadelphia: Point Breeze, Sept. 17, 1898, A. F. Krout.

21. *ORYZOPSIS* Michx.

Mountain Rice.

Tufted perennial grasses with flat or convolute leaves and few-flowered panicles. Spikelets 1-flowered; glumes about equal, obtuse or acuminate; lemma somewhat indurated, convolute, bearing a terminal, deciduous, slender awn; palea rather large; grain free, tightly enclosed in the convolute lemma.

Spikelets, excluding awn, less than 5 mm. long, blades narrow involute.

Spikelets, excluding awn, more than 5 mm. long; blades broad, flat. 1. *O. pungens*.

Leaves mostly crowded at the base of the plant; blades rough on upper surface, but not pubescent 2. *O. asperifolia*.

Leaves distributed along the culm; blades pubescent on the upper surface. 3. *O. racemosa*.



Fig. 95. *Oryzopsis pungens* (Slender Mountain Rice). A. Inflorescence; B. Spikelet.

1. *ORYZOPSIS PUNGENS* (Torr.) Hitchc.

[Fig. 95]

Slender Mountain Rice.

Milium pungens Torr.*Oryzopsis canadensis* Torr.*Oryzopsis juncea* B. S. P.

Culms 2-5 dm. high, erect, slender; sheaths usually crowded at the base of the culm, the blades of these lower leaves are very long while those of the culm are very short, narrow, involute; panicles 3-6 cm. long, branches erect or ascending; spikelets, exclusive of awn, 3-4 mm. long; glumes about equal, glabrous, whitish; lemma appressed pubescent; awn 1-2 mm. long, sometimes none. May-June.

This species is found in dry rocky places from Pennsylvania to Labrador and westward to British Columbia. No specimen from this state has been seen.

Distribution in Pennsylvania.

Lackawanna: Bald Mount, Clark Summit, Flora Northeastern Penna. Luzerne, Monroe: Porter's Flora.



Fig. 96. *Oryzopsis asperifolia* (White-grained Mountain Rice). A. Inflorescence; B. Spikelet.

2. ORYZOPSIS ASPERIFOLIA Michx.

[Fig. 96]

White-grained Mountain Rice.

Urachne asperifolia Trin.

Culms 2-7 dm. long; sheaths smooth, crowded at the base; blades erect, basal ones very long, often exceeding the culm, scabrous above, 4-8 mm. wide, culm blades usually less than 1 cm. long; panicle 5-12 cm. long, contracted, branches short, erect; spikelets exclusive of awn 6-8 mm. long; glumes nearly equal, short-ciliate at the short, abruptly pointed apex; callus short, hard, barbate; lemma sparingly pubescent, bearing an awn 5-10 mm. long, not turning black, lodicules $\frac{3}{4}$ as long as the palea. May-June.

This grass is found in woods from Newfoundland to British Columbia, south to New Jersey, Pennsylvania, Minnesota, and along the Rocky Mountains to New Mexico. "This grass is evergreen, and in the northern parts of New England, where it is known as 'winter grass,' it affords excellent grazing."

Distribution in Pennsylvania.

Blair Porter's Flora. Centre: Bear Meadows, Aug. 10, 1921, E. M. G. Erie: Big Bend, Presque Isle, May 8, 1880, Guttenberg. Huntington, Luzerne, Monroe, Somerset: Porter's Flora.

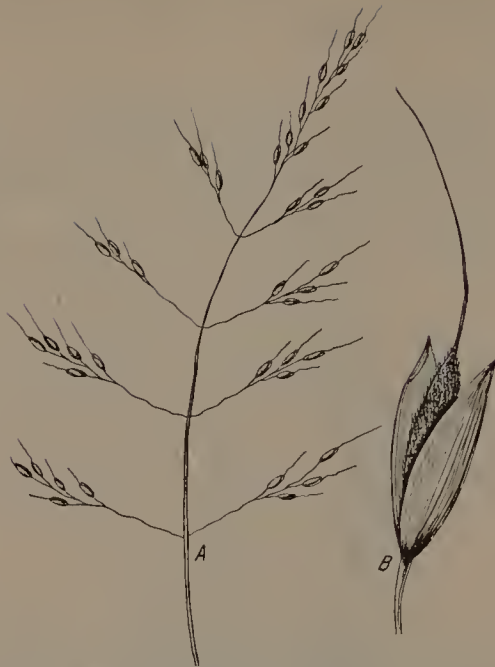


Fig. 97. *Oryzopsis racemosa* (Black-fruited Mountain Rice). A. Inflorescence; B. Spikelet.

3. ORYZOPSIS RACEMOSA (J. E. Smith) Ricker.

[Fig. 97]

Black-fruited Mountain Rice.

Urachne racemosa Trin.

Oryzopsis melanocarpa Muhl.

Milium racemosum J. E. Smith.

Culms 3-12 dm. high, leafy to the summit; sheaths usually smooth; blades flat, 10-30 cm. long, 4-15 mm. wide, narrow toward the base, pubescent above; panicles 7-25 cm. long, branches usually ascending; spikelets exclusive of the awns, 7-9 mm. long; glumes about equal, acute; lemma sparingly pubescent, becoming black in fruit, with an awn 1.5-2.5 cm. long; lodicules minute. July-August.

This grass is found in rocky woods from Maine to Ontario and southward to Delaware, Kentucky and Iowa.

Distribution in Pennsylvania.

Berks: Flora of Phila. and vicinity. Bucks: Porter's Flora. Centre: The Rock, near State College, Aug. 9, 1921, E. M. G. Delaware: Herb. Phila. Acad. Sc. Huntingdon, Lancaster: Porter's Flora. Lehigh: Herb. Phila. Acad. Sc. Luzerne: Porter's Flora. Montgomery: Flora of Phila. and vicinity. Northampton: Easton, July 14, 1896, A. A. Tyler. Philadelphia, Pike and Somerset: Porter's Flora.

22. STIPA L.

Spear Grass.

Generally tall, tufted, perennial grasses with convolute leaves and loose terminal panicles. Spikelets 1-flowered; glumes narrow, acute or awn-pointed; lemma rigid, convolute, with a hairy callus at the base, bearing a bent twisted awn; palca 2-nerved, small; grain free, tightly enclosed in the hard lemma.



Fig. 98. *Stipa avenacea* (Spear Grass). A. Inflorescence; B. Empty glumes; C. Floret.

STIPA AVENACEA L.

[Fig. 98]

Spear Grass.

Stipa barbata Michx.

Culms 3-10 dm. high, slender, erect, leafy at the base, glabrous; sheaths shorter than the internodes; blades long, narrow, involute filiform, basal leaves $1\frac{1}{3}$ -1 $\frac{1}{2}$ as long as the culm, culm leaves much shorter (4-10 cm.); panicle 1-2 dm. long, branches lax, erect, finally spreading; glumes 8-12 mm. long, often purplish, acute, glabrous; lemma dark-brown, smooth below, scabrous above, with a fringe of short hairs at the summit and bearing a bent twisted awn 4-7.5 cm. long; callus (below the lemma) covered with dense brownish hairs. May-June.

This grass is found in dry woods from Massachusetts to Wisconsin and southward to Florida and Texas.

Distribution in Pennsylvania.

Chester, Delaware: Flora of Phila. and vicinity. Lancaster: 1884, Jas. Galen. Philadelphia: Flora of Phila. and vicinity. Venango: June, 1886, E. T. Aschman.

23. BRACHYELYTRUM Beauv.

A tall perennial with flat leaves, simple culms from short, knotty rhizomes, and few-flowered narrow panicles. Spikelets 1-flowered, the rachilla produced beyond the flower as a slender bristle sometimes terminated by a small scale; glumes unequal, very small; lemma rigid, 5-nerved, ending in long straight awn, palea rigid, nearly as long as the lemma; grain free, enclosed in the lemma and palea.

BRACHYELYTRUM ERECTUM (Schreb.) Beauv.

[Fig. 99]

Bearded Short-husk.

Muhlenbergia erecta Schreb.

A tall plant from short knotty root-stock; culm simple, erect, slender, smooth or often pubescent near the nodes; sheath shorter than the internodes, usually retrorsely pubescent or sometimes nearly smooth except near the ligule where it is especially hairy; blades 8-20 cm. long, 1-1.8 cm. wide, lanceolate, narrowed toward the base, scabrous, pilose on the nerves beneath; panicle 1-2 dm. long, narrow; lower glume minute or wanting, upper less than $\frac{1}{3}$ the length of the lemma; lemma about 1 cm. long with an awn about twice as long; rachilla produced beyond the flower and lying in the groove of the palea. July-August.

Found in moist, shady places from Newfoundland to Minnesota and southward.



Fig. 99. *Brachyelytrum erectum* (Bearded Short-husk). A. Inflorescence; B. Spikelet.

Distribution in Pennsylvania.

Cambria: Johnstown, July 13, 1874, B. H. P. Chester: Porter's Flora. Crawford: Hartstown, Aug. 5, 1918, E. M. G. Delaware: In woods, Springfield, July 23, 1903, Benj. H. Smith. Erie: Porter's Flora. Fayette: Ohiopyle, Sept. 1, 1901, J. A. S; July 3, 1915, John Bright. Franklin, Lackawanna: Porter's Flora. Lancaster: Martie Hill Flora, Aug. 10, 1887, Jas. Galen. McKean: Wetmore, Aug. 23, 1919, E. M. G. Monroe: Porter's Flora. Northampton: Easton, July 14, 1896, A. A. Tyler. Philadelphia, Pike: Porter's Flora.

24. MUHLENBERGIA Schreb.

Our species perennial with flat or involute leaves, usually contracted panicles, and often scaly rhizomes, spikelets 1-flowered, usually with a small bearded callus below the floret; glumes membranous or hyaline, acute, sometimes awned; lemma narrow, 3-nerved, awned or awnless; palea thin; grain free, tightly enclosed in the lemma.

Panicle diffuse, pedicels capillary1. *M. capillaris*.
Panicle contracted, usually narrow.

Glumes not over $1/4$ as long as the lemma; no rootstocks.....2. *M. schreberi*.
Glumes at least $1/2$ as long as the lemma; scaly rootstocks.

Glumes broadly ovate, $1/2$ - $3/4$ as long as the lemma.

Lemmas awned3. *M. tenuiflora*.

Lemmas awnless4. *M. sobolifera*.

Glumes lanceolate, acute or awn-pointed, scarcely, equaling or slightly longer than the lemma.

Culms smooth below the nodes5. *M. mexicana*.

Culms with very fine short hairs or pulverulence below the nodes.

Panicle linear, not densely flowered; lemma usually long awned.

6. *M. umbrosa*.

Panicle oblong or cylindrical, densely flowered; lemma usually not awned.

7. *M. foliosa*.

Glumes aristate, much exceeding the lemma8. *M. racemosa*.

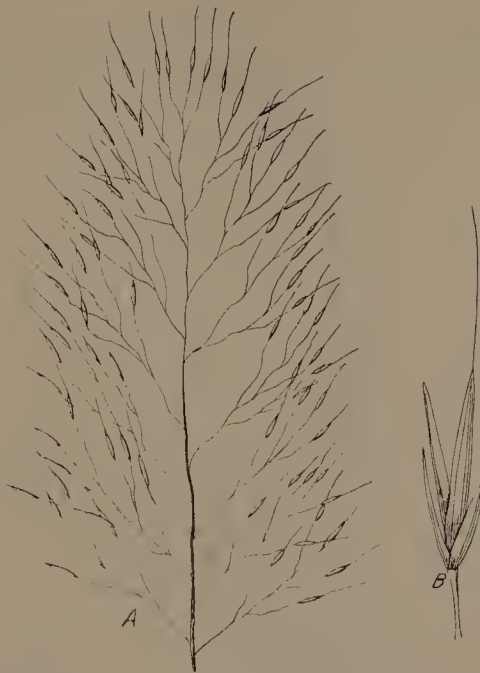


Fig. 100. *Muhlenbergia capillaris* (Long-awned Hair Grass). A. Inflorescence; B. Spikelet.

1. MUHLENBERGIA CAPILLARIS (Lam.) Trin.

[Fig. 100]

Long-awned Hair Grass.

Stipa capillaris Lam.

Muhlenbergia capillaris Trin.

Culms 6-10 dm. high, simple, rigid, usually smooth; sheaths smooth, lower ones short, overlapping, upper ones longer, blades 1-3 dm. long, involute, stiff; panicles about $\frac{1}{3}$ the length of the plant, slender hair-like branches spreading, loosely flowered; spikelets reddish or purplish, 4 mm. long exclusive of awn; glumes about $\frac{1}{2}$ as long as the lemma, unequal, acute or short awned; lemma bearing a delicate awn 5-20 mm. long. August-October.

This species is found in dry, sandy or gravelly soil from Massachusetts to Florida and west to Missouri and Texas. No specimens of this plant from Pennsylvania have been seen. Porter (Flora of Pennsylvania) reports it from Gap, Lancaster Co. Small and Carter (Flora of Lancaster Co.) report it as "rather rare, in rocky or sandy soil."

2. MUHLENBERGIA SCHREBERI Gmel.

[Fig. 101]

Nimble Will.

Muhlenbergia diffusa Willd.

Culms 3-8 dm. long, usually ascending from a decumbent base and rooting at the lower nodes, smooth, branched; sheaths smooth, loose; blades 3-8 cm. long, 24 mm. wide, rough; panicles 5-15 cm. long, numerous, slender, erect, branches rather densely flowered; spikelets about 2 mm. long exclusive of awn; first glume wanting or scarcely visible, second very small, not pointed; lemma with a slender awn 3-5 mm. long. August-September.

This species is very common in dry woods, hillsides and waste places. It is found from Maine to Minnesota and southward to Florida and Texas.



Fig. 101. *Muhlenbergia schreberi* (Nimble Will). A. Inflorescence; B. Spikelets.

Distribution in Pennsylvania.

Allegheny: Common in dry sandy or gravelly places. Blair, Bucks: Porter's Flora. Centre: State College, Aug. 10, 1921, E. M. G. Chester: Porter's Flora. Crawford: Linesville, Sept. 13, 1919, E. M. G. Dauphin: Harrisburg, Aug. 20, 1922, E. M. G. Delaware: Porter's Flora. Erie: Evans Woods, near Erie, Sept. 10, 1879, Gnttenberg. Fayette: Ohiopyle, Oct. 20, 1901, J. A. S. Franklin, Huntingdon: Porter's Flora. Lancaster: "Rather rare, in dry soil." Flora of Lancaster County. Northampton: Easton, Sept. 19, 1896, A. A. Tyler; College Hill, Easton, Sept. 5, 1898, Porter. Philadelphia: Porter's Flora.

3. MUHLENBERGIA TENUIFLORA (Willd.) B. S. P.

[Fig. 102]

Slender Muhlenbergia.

Agrostis tenuiflora Willd.

Muhlenbergia willdenovii Trin.

Sealy rootstock; culms 3-9 dm. high, pubescent below the nodes with downward pointing hairs, nodes pubescent; sheaths usually shorter than the internodes; blades narrowed toward the base, 5-15 cm. long, 2-8 mm. wide, scabrous; panicle slender 1.5-3 dm. long, branches erect; spikelets 3-4 mm. long; glumes unequal, $1/2$ to $2/3$ as long as the lemma, the lower one broad and clasping; lemma bearing an awn 5-10 mm. long. August-September.

This species is found in rocky woods from Massachusetts to Ontario, Minnesota, and southward.

Distribution in Pennsylvania.

Blair, Bucks, Chester: Porter's Flora. Crawford: Hartstown, Aug 5, 1918, E. M. G. Delaware: Porter's Flora. Fayette: Ohiopyle,

Sept. 1, 1901, J. A. S. Franklin, Huntingdon: Porter's Flora. Lancaster: 1887, Jas. Galen. Northampton: College Hill, Easton, Sept. 6, 1899, Porter. Philadelphia: Wissahickon, Flora of Phila. and vicinity.



Fig. 102. *Muhlenbergia tenuiflora* (Slender Muhlenbergia). A. Inflorescence; B. Empty Glumes; C. Floret.



Fig. 103. *Muhlenbergia sobolifera* (Rock Dropseed). A. Empty Glumes; B. Floret.

4. MUHLENBERGIA SOBOLIFERA (Muhl.) Trin.

[Fig. 103]

Rock Dropseed.

Agrostis sobolifera Muhl.

Scaly rootstock; culms slender, erect, 4-8 dm. high, rough below the nodes; sheaths smooth; blades rough, 8-12 cm. long, 4-6 mm. wide, extending almost at a right angle from the culm; panicles 6-18 cm. long, very slender, usually loosely flowered; spikelets 1.5-2 mm. long; glumes sharp pointed, $1/2$ - $3/4$ as long as the scabrous awnless lemma. September-October.

This species is found in rocky woods from New England to Minnesota and southward.

Distribution in Pennsylvania.

Allegheny: Harmarville, B. H. P. Bucks: Herb. Phila. Acad. Sc.

Chester: Porter's Flora. Delaware: Herb. Phila. Acad. Sc. Franklin, Huntingdon, Lancaster: Porter's Flora. Lehigh: Herb. Phila. Acad. Sc. Monroe: Delaware Water Gap, Aug. 8, 1920, E. M. G. Montgomery, Northampton, Philadelphia: Herb. Phila. Acad. Sc.



Fig. 104. *Muhlenbergia mexicana* (Mexican Dropseed). A. Inflorescence; B. Spikelet. C. Floret.

5. MUHLENBERGIA MEXICANA (L.) Trin.

[Fig. 104]

Mexican Dropseed.

Agrostis mexicana L.

Agrostis filiformis Willd.

Scaly rootstock; culms decumbent and rooting at the lower nodes (a distinction between this species and *M. umbrosa* and *M. foliosa*); panicles numerous, 5-10 cm. long, terminal on the culm and its many branches, usually partly enclosed in the upper sheath; spikelets 2.5-3 mm. long, crowded; glumes acuminate, about the length of the lemma (slightly shorter or sometimes a little longer); lemmas acuminate. August-September.

This species and *M. schreberi* are very common in sandy meadows and along streams. It is found from New Brunswick to Ontario and South Dakota and southward. It varies considerably; the panicles are usually dense approaching somewhat *M. racemosa* but sometimes they are rather slender. If cut early it makes fair forage but later becomes woody. In cultivated fields and gardens it may become a troublesome weed. Thorough cultivation, exposing the rootstock to the sun, is the best method of eradication.

Distribution in Pennsylvania.

Allegheny: Common in low grounds. Bucks, Chester, Clearfield: Porter's Flora. Dauphin: Harrisburg, Oct. 12, 1919, W. A. McCubbin. Delaware: Porter's Flora. Erie: Big Bend, Presque Isle, Sept. 6, 1879, Guttenberg. Franklin, Huntingdon: Porter's Flora. Lancaster: 1884, Jas. Galen. Northampton, Philadelphia: Porter's Flora.



Fig. 105. *Muhlenbergia umbrosa* (Wood Muhlenbergia). A. Inflorescence; B. Spikelet; C. Floret.

6. MUHLENBERGIA UMBROSA Scribn.

[Fig. 105]

Wood Muhlenbergia.

Muhlenbergia sylvatica Torr.

Scaly rootstock; culms 6-9 dm. high, erect, branched, leafy, fine short hairs or pulverulence for 2-5 cm. below the nodes; sheaths smooth or slightly scabrous; blades 5-18 cm. long, 2-6 mm. wide, rough; panicle 1-2 dm. long, lax, linear or filiform, not crowded, branches erect or ascending; spikelets, green or straw-colored, 2.5-3 mm. long without the awn; glumes acuminate, sometimes short awned, shorter than the lemma; lemma bearing an awn 6-12 mm. long, callus hairs $1/3$ to $1/2$ as long as lemma. August-October.

This species is found in moist woods and on moist banks of streams from New Brunswick to South Dakota and southward to North Carolina and Oklahoma.

Distribution in Pennsylvania.

Bucks, Clearfield, Chester: Porter's Flora. Dauphin: Harrisburg, Aug. 29, 1920, E. M. G. Delaware: Porter's Flora. Fayette: Ohiopyle, Aug. 18, 1918, E. M. G. Fulton: Dane, Aug. 25, 1918, E. M. G. Lancaster: 1886, Jas. Galen. Lebanon: Porter's Flora. Lehigh: Flora of Phila. and Vicinity. Monroe, Northampton, Philadelphia: Porter's Flora. Somerset: Stoystown, July 31, 1885, B. H. P.; Mostollar, Sept. 1, 1886, B. H. P.; Stony Creek, near Johnstown, Aug. 9, 1874, B. H. P. Wayne: Irving Cliff, Honesdale, Aug. 21, 1920, E. M. G., O. E. J., G. K. J. York: Frogtown, Sept. 11, 1921, E. M. G.

7. MUHLENBERGIA FOLIOSA Trin.

[Fig. 106]

Scaly rootstock. This species is very similar to *M. umbrosa* in habit, size and general appearance. The panicle are usually long-exserted, a little heavier; the spikelets are a little more crowded on shorter ascending branches, *usually purplish*; glumes nearly or quite equal to the lemma, or sometimes slightly longer; lemma awnless or short awned; callus hairs $1/3$ to $1/2$ as long as lemma.

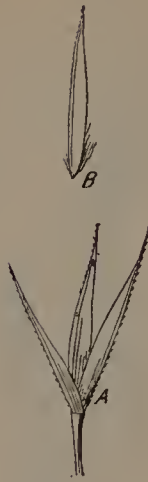


Fig. 106. *Muhlenbergia foliosa*. A. Spikelet; B. Floret.

This species is found in swampy ground from Maine to Ontario, South Dakota, and southward.

Distribution in Pennsylvania.

Allegheny: Pittsburgh, about 1890, B. H. P.; Saunders, Sept. 20, 1919, E. M. G. Chester: Herb. Phila. Acad. Sc. Crawford: Pymatuning Swamp, Hartstown, Sept. 13, 1919, E. M. G. Delaware, Lehigh: Herb. Phila. Acad. Sc. Mercer: Barmore Lake, near Grove City, Sept. 3, 1922, John Bright. Northampton: Herb. Phila. Acad. Sc. Perry: New Bloomfield, Sept. 29, 1920, E. M. G.



Fig. 107. *Muhlenbergia racemosa* (Marsh Muhlenbergia). A. Portion of stem; B. Inflorescence; C. Rootstocks and roots; D. Spikelet; E. Floret.

7. MUHLENBERGIA RACEMOSA (Michx.) B. S. P.

[Fig. 107]

Marsh Muhlenbergia.

Agrostis racemosa Michx.*Muhlenbergia glomerata* Trin.

Scaly rootstock; culms 3-9 dm. high, often branched, smooth, with short, fine pubescence below the nodes; blades 5-12 dm. long, scabrous; panicles 5-10 cm. long, dense, interrupted below; spikelets 4-6 mm. long; the long-acuminate or awn pointed glumes considerably longer than the lemma, sometimes about twice as long; lemma acute, bearded at the base. July-October.

This species is found in moist meadows and wet places from Newfoundland to New Jersey and westward. The dense spike-like racemes resemble very much the spikes of our common timothy but are more interrupted, hence the common name wild timothy. The plant is not of much value agriculturally; however, if cut when young, it affords some forage. Not common.

Distribution in Pennsylvania.

Bucks, Chester, Crawford, Erie, Lancaster: Porter's Flora. Lawrence: East of New Castle, Sept. 30, 1922, John Bright. Lehigh: Herb. Phila. Acad. Sc. Lycoming, Monroe: Porter's Flora. Northampton: Herb. Phila. Acad. Sc. Pike: Porter's Flora. Wayne: Foot of Irving Cliff, Honesdale, Aug. 21, 1920, E. M. G., O. E. J., G. K. J.

25. ALOPECURUS L.

Foxtail Grass.

Branching annual or perennial grasses with flat leaves, erect or decumbent culms, and dense terminal cylindrical spike-like panicles. Spikelets 1-flowered, compressed, articulate below the glumes, falling entire; glumes equal, more or less united below, awnless or sometimes short awned, ciliate on the keel; lemma obtuse, 5-nerved, with a slender dorsal awn from below the middle, margins sometimes united into a short tube at the base; palea usually none.

Glumes scarcely ciliate on keels.1. *A. agrestis*
Glumes distinctly ciliate on keels.

Spikes oblong-linear, 8 to 10 mm. thick; spikelets 4 to 6 mm. long.

2. *A. pratensis*

Spikes slender, 3 to 5 mm. thick; spikelets not over 3 mm. long.

Awn attached near the base and usually exerted the length of the glume or more3. *A. geniculatus*.

Awn attached near the middle and usually scarcely exerted 4. *A. aristulatus*

1. ALOPECURUS AGRESTIS L.

[Fig. 108]

Slender Foxtail Grass.

Alopecurus myosuroides Huds.

A slender perennial; culms erect or decumbent at the base, glabrous, 3-6 dm. high; sheaths shorter than the internodes; blades scabrous especially above; spike-like panicle rather slender, 3.5-12 cm. long; spikelets 6-7 mm. long; glumes very short-pubescent on the keel, grown together for 1/3 of their length; lemma about equaling the glumes, awn inserted near the base, and two or more times as long. July-August.

Found on waste places and ballast, Massachusetts, New Jersey, Pennsylvania, and on the Pacific Coast.

Distribution in Pennsylvania.

Lancaster: Herb. Phila. Acad. Sc. Philadelphia: Porter's Flora, on and near ballast.



Fig. 108. *Alopecurus agrestis* (Slender Foxtail Grass). A. Inflorescence;
B. Spikelet; C. Lemma with awn.



Fig. 109. *Alopecurus pratensis* (Meadow Foxtail Grass). A. Inflorescence;
B. Spikelet.

2. ALOPECURUS PRATENSIS L.

[Fig. 109]

Meadow Foxtail Grass.

An erect perennial from a short creeping root-stock; culms 3-9 dm. high; sheaths smooth, loose, the uppermost usually inflated; blade scabrous, 8-20 cm. long, 4-6 mm. wide; spike-like panicle rather stout, 5-10 cm. long; spikelets 4-6 mm. long; glumes acute, long-ciliate; lemma equaling the glume, awned from near or below the middle; awn slender, projecting beyond the glumes for more than half its length. May-July.

Found in meadows and pastures from N. F. to N. Y., N. J. and Ohio. It is of little value as a forage plant.

Distribution in Pennsylvania.

Philadelphia: Herb. Phila. Acad. Sc.

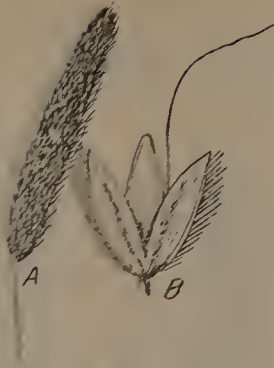


Fig. 119. *Alopecurus geniculatus* (Floating Foxtail Grass). A. Inflorescence.
B. Spikelet.

3. ALOPECURUS GENICULATUS L.

[Fig. 119]

Floating Foxtail Grass.

A slender perennial; culm 3-9 dm. high, usually decumbent, lower joints geniculate, finally erect, smooth; sheath loose or somewhat inflated; blades smooth or slightly scabrous, lower ones 6-12 cm. long, the upper shorter; panicles spike-like, soft, slender, 2.5-7.5 cm. long; spikelets laterally compressed, about 3 mm. long; glumes nearly equal, slightly connected at base, lateral nerves pubescent, keel strongly ciliate; lemma a little shorter than the glumes, obtuse, smooth, awned from near the base, awn bent, the exerted portion usually twice the length of the glumes. July-September.

Found in moist meadows, banks of streams and ditches throughout the U. S. It is a good pasture grass for low wet soil. This grass, as well as the other species, at first glance might be mistaken for our common timothy.

Distribution in Pennsylvania.

Delaware: Tinicum, Porter's Flora. Huntingdon, Luzerne: Porter's Flora. Philadelphia: below Navy Yard, Herb. Phila. Acad. Sc.

4. ALOPECURUS ARISTULATUS Michx.

Wild Water Foxtail.

Alopecurus geniculatus aristulatus (Michx.) Torr.

Culms 1-5 dm. tall, slender, usually erect; sheaths smooth; blades 3-15 cm. long, 1-4 mm. wide, rough; spikes 2-6 cm. long, slender; spikelets similar to those of *A. geniculatus*, except as noted in the key.

This species grows in the water along the edge of ponds or streams or in very wet soil, from Maine to Alaska, Pennsylvania and California.

Distribution in Pennsylvania.

Allegheny: Cheswick, Elliott's Nursery, June 10, 1919, J. Jones. Delaware: Tinicum (Specimen in National Herbarium) Dr. Geo. Smith.

26. HELEOCHLOA Host.

Rush-like Timothy.

Cat-tail Grass.

Low tufted branching annuals or perennials with flat leaves and numerous spike-like panicles partly included in the inflated upper sheaths. Spikelets 1-flowered.

flattened; glumes nearly equal, membranous, acute, ciliate-keeled; lemma fully as long as the glumes, similar, 1-nerved; palea shorter, 2-nerved; stamens 3; grain free, loosely enclosed in the lemma and palea.



Fig. 111. *Heleochoa schoenoides* (Rush-like Timothy). A. Portion of plant with inflorescence; B. Spikelets.

HELEOCHLOA SCHOENOIDES (L.) Host.

[Fig. 111]

Rush-like Timothy.

Phleum schoenoides L.

A low branching caespitose annual; culms usually almost prostrate, 1-dm. long, branched, smooth; sheaths shorter than the internodes, the upper ones inflated and usually enclosing the spike; blades 2-6 cm. long, 2-4 mm. wide, flat, rigid, smooth beneath, scabrous above; spike-like panicles 1-3 cm. long; glumes acute, compressed, ciliate on the keels, the lower a little shorter than the upper; lemma a little longer than the glumes, compressed, scabrous on the keel above. July-August.

This plant has been introduced from Europe and is found in waste places from New York to Delaware and eastern Pennsylvania; also in Illinois. The spike of it looks very much like small spikes of timothy but it can easily be distinguished by its spreading, mat-like habit.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Chester: Herb. Phila. Acad. Sc. Delaware: Flora of Phila. and vicinity. Lancaster: Porter's Flora. Montgomery: Herb. Phila. Acad. Sc. Philadelphia: Near Salt Works, July 20, 1898, A. F. K. Krout.

27. PHLEUM L.

Timothy.

Erect, simple grasses with flat leaves and dense spike-like terminal panicles. Spikelets 1-flowered, compressed, crowded; glumes equal, ciliate-keeled, abruptly awn-pointed, longer than the lemma; lemma 5-nerved, hyaline, truncate; palea narrow, hyaline; grain free, enclosed in the lemma and palea.

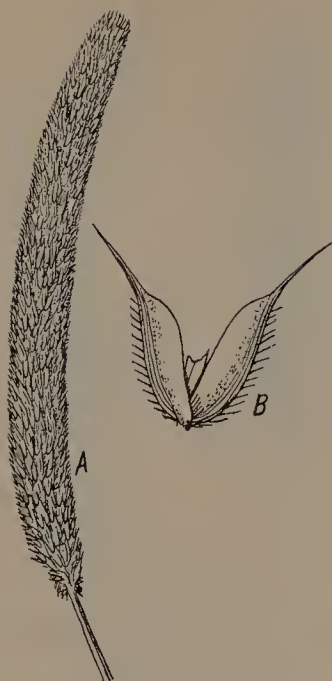


Fig. 112. *Phleum pratense* (Timothy). A. Inflorescence; B. Spikelet.

1. PHLEUM PRATENSE L.

[Fig. 112]

Timothy. Herd's Grass.

Culms 4-10 dm. high from a swollen, bulb-like base; sheaths smooth, ligule 2-4 mm. long; blades 8-25 cm. long, 4-6 mm. wide, smooth or scabrous; spike (panicle) cylindrical, 4-18 cm. long, 5-8 mm. thick; spikelets usually about 3 mm. (2-5 mm.) long; glumes keeled, abruptly terminating in awn 1-2 mm. long; lemmas about $1\frac{1}{2}$ as long as the glumes. June-August.

This is our common cultivated timothy which is so extensively used for hay. It is found nearly throughout North America, also in Europe and Asia. It is so common everywhere in the State that the distribution is omitted.

2. PHLEUM TENUE Schrad. Fl. Germ. I: 191.

Annual; leaves narrow (1-3 mm. wide); inflorescence glaucous-green; glumes glabrous, scabrous, tuberculate, not ciliate.

This is an Eurasian species which was collected on ballast in Philadelphia, June, 1878, by I. C. Martindale. The specimen is in the Herbarium of the Philadelphia Academy of Science, and so far as is known, is the only specimen ever collected in the state. It is unquestionably a transient. I am indebted to Mr. Stewardson Brown of Philadelphia for the verification and the description of this species.

28. POLYPOGON Desf.

Beard Grass.

Mostly annual grasses with decumbent or erect culms, flat leaves and dense spike-like panicles. Spikelets 1-flowered falling entire; glumes subequal, entire or 2-lobed, bearing a straight awn from the apex; lemma smaller than the glumes, emarginate or bifid, bearing an awn from below the apex; palea shorter than the lemma; stamens 1-3; grain free, enclosed in the lemma and palea.



Fig. 113. *Polypogon monspeliensis* (Annual Beard Grass). A. Inflorescence; B. Spikelet.

POLYPOGON MONSPELIENSIS (L.) Desf.

[Fig. 113]

Annual Beard Grass.

Alopecurus monspeliensis L.

An annual; culms 1-6 dm. high, erect or decumbent at the base; sheaths loose, sometimes slightly scabrous; blades 4-15 cm. long, 3-6 mm. wide, scabrous; panicles 2-10 cm. long, dense, interrupted, pale, soft silky, sometimes partly included in the uppermost sheath; spikelets 1-flowered, 2.5-3 mm. long; glumes subequal, entire or two-lobed, bearing an awn from the apex 4-6 mm. long; lemma shorter than the glumes, hyaline, bearing an awn about 1/2 mm. long. June-September.

This grass is found in waste places from Maine southward mostly near the coast and in western North America where it is abundant. It is rare in Pennsylvania having been reported only from Philadelphia and Bucks Counties (Porter's Flora and Flora of Philadelphia and Vicinity).

29. SPOROBOLUS R. Br.

Dropseed. Rush Grass.

Perennial or rarely annual grasses with flat or convolute leaves and terminal panicles, which are narrow and spike-like or loose and spreading. Spikelets 1-flowered, awnless; glumes usually unequal, membranous; lemma 1-nerved, equaling or longer than the glumes; palea about as long as the lemma, often splitting at maturity; grain free and readily falling from the spikelet.

Panicles contracted.

Panicle 1/3-1/2 the entire height of the plant1. *S. bertcroanus*.

Panicle not more than 1/3 the entire height of the plant.

Annuals; spikelets 2.5-4.5 mm. long.

Lemma glabrous; spikelets 2.5-3 mm. long2. *S. neglectus*.

Lemma pubescent; spikelets 3 1/2-4 1/2 mm. long3. *S. vaginiflorus*.

Perennials; spikelets 5 mm. long or more.

Floret glabrous4. *S. asper*.

Floret appressed pubescent below5. *S. elandestinus*.

Panicles open (sometimes contracted in *cryptandrus*).

Spikelets 2.5-3 mm. long; glumes ovate or lanceolate.6. *S. cryptandrus*.

Spikelets 4-6 mm. long; first glume awl-shaped.7. *S. heterolepsis*.



Fig. 114. *Sporobolus berterioanus* (Smut Grass). A. Inflorescence; B. Spikelet.

1. **SPOROBOLUS BERTEROANUS** (Trin.) Hitchc. and Chase.

[Fig. 114]

Smut Grass.

Hitchcock, A. S., Genera of Grasses of the U. S., U. S. Dept. of Agri. Bull. 772. 1920.

Culms 3-10 dm. high; leaves crowded at the base, blades 10-30 cm. long, 2-6 mm. wide, very long thread-like points; panicle spike-like, 10-30 cm. long (about $\frac{1}{3}$ the length of the plant); spikelets 2 mm. long; glumes unequal, obtuse, the second about $\frac{1}{2}$ as long as the acute lemma; palea slightly shorter than the lemma, obtuse.

This species has been introduced from tropical countries where it is native or naturalized. It is found on waste places, roadsides, and fields from Virginia to Arkansas and southward. If cut when young it makes good forage, but is tough and wiry when old. The panicle is frequently affected with a black fungus which gives it the name of "smut grass." Many plants belonging to this species have been incorrectly called *S. indicus* (L.) R. Br.

Distribution in Pennsylvania.

Philadelphia: On and near ballast, Porter's Flora; Herb. Phila. Acad. Sc., 1865. All specimens seen were collected in 1865. Probably only a transient.

2. **SPOROBOLUS NEGLECTUS** Nash.

[Fig. 115]

Small Rush Grass.

Culms 1.5-5 dm. high, small bunches, erect or spreading; sheaths inflated, smooth; blades short, involute, about 2 mm. wide; panicles 2-3 cm. long, inclosed in the inflated sheaths; spikelets 2.5-3 mm. long; glumes nearly equal, acute; lemma glabrous. August-September.

This species is similar to *S. vaginiflorus* but may be distinguished from that species by its shorter spikelets and glabrous lemmas. It

is found in sterile soil from New Brunswick to South Dakota and southward. H. W. Pretz collected a specimen in Lehigh County, Aug. 31, 1915, which was identified as *S. neglectus*. I have not verified this identification. So far as known, this is the only report from the State.

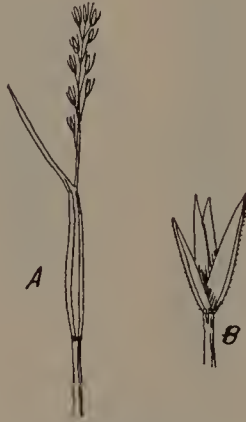


Fig. 115. *Sporobolus neglectus* (Small Rush Grass). A. Inflorescence; B. Spikelet.



Fig. 116. *Sporobolus vaginiflorus* (Sheathed Rush Grass). A. Inflorescence. B. Spikelet.

3. SPOROBOLUS VAGINIFLORUS (Torr.) Wood.

[Fig. 116]

Sheathed Rush Grass.

Culms tufted, 2-6 dm. high, slender, erect or spreading, smooth; sheaths usually all inflated, smooth; blades short, about 2 mm. wide, involute toward the point; panicles 2-4 cm. long, terminal one short-exserted, lateral ones usually included in the inflated sheaths; spikelets $3\frac{1}{2}$ - $4\frac{1}{2}$ mm. long; glumes acuminate, nearly equal; lemma pointed, minutely appressed pubescent; palea acute and longer than the lemma. August-September.

This species is found in dry sandy soil, sterile fields and waste places from Maine to South Dakota and southward.

Distribution in Pennsylvania.

Allegheny: Pittsburgh, Sept. 19, 1885, B. H. P. Bucks, Chester, Delaware, Franklin, Huntingdon: Porter's Flora. Northampton: Easton, Sept. 16, 1896, A. A. Tyler; Chestnut Hill, Easton, Sept. 6, 1899, Porter. Philadelphia: Porter's Flora. Somerset: By the roadside, Stoystown, Sept. 2, 1886, B. H. P.



Fig. 117. *Sporobolus asper* (Long-leaved Rush Grass). A. Inflorescence; B. Spikelet.

4. *SPOROBOLUS ASPER* (Michx.) Kunth.

[Fig. 117]

Long-leaved Rush Grass.

Agrostis asper Michx.

Culms stout, 3.5-10 dm. high, smooth; sheaths smooth, lower ones overlapping, upper ones shorter than the internodes; blades long and slender, involute at the end, hairy at the base above; terminal panicle 8-25 cm. long, partly included in the upper sheath, lateral panicle almost concealed by the sheaths; spikelets 5-6 mm. long; glumes unequal, obtuse, glabrous; lemmas glabrous, slightly longer than the glabrous palea. August-September.

This species is found in dry, sandy soil from Maine to South Dakota and southward.

Distribution in Pennsylvania.

It is difficult to list the distribution of this grass on account of its confusion with what is now called *Sporobolus clandestinus* (Spreng.) Hitchc. Bucks: Nockamixon, Flora of Phila. and Vicinity. Dauphin: Flora of Phila. and Vicinity. Lancaster: Porter's Flora. Montgomery: Flora of Phila. and Vicinity. Northampton: Herb. Phila. Acad. Sc.



Fig. 118. *Sporobolus clandestinus* (Rough Rush Grass). A. Inflorescence; B. Spikelets.

5. **SPOROBOLUS CLANDESTINUS** (Spreng.) Hitchc.

[Fig. 118]

Rough Rush Grass.

Agrostis clandestinus Spreng.

Sporobolus clandestinus Hitchc.

Culms 4-12 dm. high, smooth; sheaths smooth; blades 7-25 cm. long, 2-4 mm. wide, attenuate into a long slender, involute tip, smooth beneath, scabrous above, or somewhat hairy at the base; panicle 5-15 cm. long, sometimes partly inclosed in the upper sheath; spikelets 6-8 mm. long; glumes unequal, acute; lemmas pubescent at the base, longer than the glumes; palea much longer than the lemma, long-acuminate or almost awned.

This species can be distinguished by its long pointed palea which is much longer than the lemma. It is found in dry, sandy soil from Connecticut to Missouri and south to Florida and Texas. This species was erroneously called *S. asper* until recently.

Distribution in Pennsylvania.

Lancaster: Flora of Lancaster County.

6. **SPOROBOLUS CRYPTANDRUS** (Torr.) Gray.

[Fig. 119]

Sand Rush Grass.

Sand Dropseed.

Agrostis cryptandra Torr.

Culms tufted, 4-7 dm. high; sheaths overlapping, ciliate on the margin, and conspicuously bearded at the summit; ligule a ring of hairs; blades 6-12 cm. long, 3-5 mm. wide, scabrous; panicle lead-colored, 12-20 cm. long, base generally included in the upper sheath, branches spreading or ascending; spikelets 2-2.5 mm. long; glumes acute, lower one about $\frac{1}{3}$ as long as the upper one, scabrous on the keel; lemma and palea about equal in length. August-September.

This species is found in sandy soil from Massachusetts and Pennsylvania westward to Montana and Washington, southward to Texas and New Mexico. Rare in Pennsylvania.

Distribution in Pennsylvania.

Erie: Misery Bay, Presque Isle, Sept. 26, 1879, Guttenberg;
Philadelphia: Herb. Phila. Acad. Sc.



Fig. 119. *Sporobolus cryptandus* (Sand Rush Grass). A. Inflorescence;
B. Spikelet.

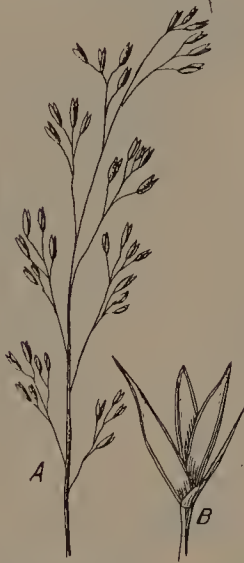


Fig. 120. *Sporobolus heterolepsis* (Northern Dropseed). A. Inflorescence;
B. Spikelet.

7. SPOROBOLUS HETEROLEPSIS Gray.

[Fig. 120]

Northern Dropseed.

Vilfa heterolepsis Gray.

Culms 6-9 dm. high, wiry, erect; sheaths sometimes sparingly pilose at the top; blades involute, glabrous, basal leaves about $\frac{3}{4}$ as long as the culm, the upper ones shorter; panicles exserted, 7-25 cm. long, open, branches ascending; spikelets 4-6 mm. long; glumes unequal, the lower about $\frac{1}{2}$ as long as the second, both sharp pointed; lemma and palea about equal, both shorter than the upper glume. August-September.

This species is found on dry soil and prairies from Quebec to Saskatchewan, south to Connecticut, Pennsylvania, Missouri, and Texas. Rare in Pennsylvania.

Distribution in Pennsylvania.

Lancaster: New Texas, Porter's Flora; Pleasant Grove, Flora of Phila. and Vicinity.

[NOTE:—Small and Carter (Flora of Lancaster Co.) give it as rare.]

30. CINNA L.

Wood Reed Grass.

Tall perennial grasses with flat leaf-blades, conspicuous hyaline ligules, and many flowered nodding panicles. Spikelets 1-flowered; rachilla articulated below the glumes, forming a short stipe below the glumes, and prolonged behind the palea into minute bristle; floret short-stiped above the glumes; glumes narrow, keeled, acute; lemma 3-nerved, short-awned from between the 2 teeth of the apex; palea slightly shorter, 1-2-nerved, the nerves close together; stamen 1; grain free, enclosed in the lemma and palea.

Spikelets 5 mm. long; glumes unequal; lemma short-awned or awnless, panicle branches ascending1. *C. arundinacea*.
Spikelets 4 mm. long; glumes subequal; awn of lemma 1-2 mm. long; panicle branches spreading or drooping2. *C. latifolia*.



Fig. 121. *Cinna arundinacea* (Wood Reed Grass). A. Inflorescence; B. Spikelet.

1. CINNA ARUNDINACEA L.

[Fig. 121]

Wood Reed Grass.

Culms usually robust, .5-1.5 m. high, erect, simple, glabrous; sheaths usually shorter than the internodes except at the base of the culm, usually smooth; blades slightly scabrous, 2-3 dm. long, about 1 cm. wide; panicle 1.5-3.5 dm. long, branches slender, erect or drooping, sometimes purplish; spikelets 5 mm. long; glumes unequal, pointed, scabrous especially on the keel; lemma about equaling the second glume, 2-toothed with a short awn (1 mm. or less long) between the teeth; palea 1-nerved. August-September.

This grass is common in moist woods and shaded damp places. Found from Nova Scotia to Ontario and southward.

Distribution in Pennsylvania.

Blair, Bucks, Chester: Porter's Flora. Crawford: Hartstown, July 31, 1918, E. M. G. Delaware: Porter's Flora. Fayette: Ohiopyle,

Aug. 18, 1918, E. M. G. Franklin, Huntingdon: Porter's Flora. Lancaster: 1886, Jas. Galen. Luzerne, Northampton: Porter's Flora. Venango: Oil City, Sept. 15, 1879, B. H. P. Westmoreland: Ligonier, Aug. 24, 1918, E. M. G.

[NOTE:—A specimen is in the Carnegie Museum Herb. from Narrowsville, Pennsylvania, Sept. 5, 1896, A. A. Tyler.]



Fig. 122. *Cinna latifolia* (Wood or Sweet Reed Grass).

2. CINNA LATIFOLIA (Trev.) Griseb.

[Fig. 122]

Wood or Sweet Reed Grass.

Cinna pendula Trin.

Agrostis latifolia Trev.

Similar to *Cinna arundinacea* but usually more slender and with a more open, less dense panicle. The spikelets are shorter, being about 4 mm. long; glumes almost or entirely equal; awn of lemma 2-4 times as long as the very short awn of *C. arundinacea*. August-September.

Found in damp woods or moist shaded places from Newfoundland to British Columbia, south to New England, New York, the Great Lakes Region and westward. In the Allegheny Mountains to North Carolina and in the Rocky Mountains to Colorado and Utah.

Distribution in Pennsylvania.

Blair, Erie, Huntingdon, Lackawanna, Monroe, Pike: Porter's Flora. Somerset: Stoystown, Aug. 26, 1874, B. H. P.

31. CALAMAGROSTIS Adans.

Reed Bent Grass.

Tall erect perennial grasses usually with flat leaves, running rhizomes, and terminal contracted or open panicles. Spikelets 1-flowered, the rachilla prolonged beyond the flower into a hairy bristle or pedicel; glumes subequal, keeled, membranous; lemma awned on the back, usually from below the middle, surrounded at the base with copious long hairs, palea shorter than the lemma; grain free, enclosed in the lemma and palea.

Prolongation of the rachilla hairy only at the top 1. *C. cinnoides*.
Prolongation of the rachilla hairy its whole length.

Awn strongly bent, exserted; basal hairs usually much shorter than the lemma 2. *C. porteri*.

Awn straight, included; basal hairs usually little if any shorter than the lemma.

Panicle open, the lower branches widely spreading.3. *C. canadensis*.
Panicle contracted, branches ascending4. *C. incanpansa*.



Fig. 123. *Calamagrostis cinnoides* (Nuttall's Reed Grass). A. Spikelet;
B. Floret.

1. CALAMAGROSTIS CINNOIDES (Muhl.) Scribn.

[Fig. 123]

Nuttall's Reed Grass.

Arundo cinnoides Muhl.

Calamagrostis nuttalliana Steud.

Culms glaucous 1-1.8 m. high, erect, solitary or few; sheaths shorter than the internode, usually rough; ligule 2-4 mm. long; blades scabrous, sometimes sparingly hirsute, 1.5-3 dm. long, 5-10 mm. long; panicle 8-17 cm. long, contracted, the short branches erect; spikelets 6-7 mm. long, often purplish; glumes about equal, keeled, very scabrous, acuminate; lemma shorter than the glumes, awned from the back above the middle; callus hairs $1/2$ or $2/3$ as long as the floret; prolongation of rachilla bearing a tuft of hairs at the end nearly as long as the lemma. July-August.

This grass is found in moist soil from Maine to Ohio and south to Georgia and Alabama.

Distribution in Pennsylvania.

Bucks, Chester: Porter's Flora. Cumberland: Hunter's Run, Sept. 2, 1921. E. M. G.; Pine Grove Furnace, Oct. 15, 1921. E. M. G. Dauphin, Delaware, Huntingdon: Porter's Flora. Lackawanna: Moosic Lake, Aug. 26, 1920 E. M. G., O. E. J. Lancaster, Lebanon, Montgomery: Porter's Flora. Monroe: Pocono Plateau, Aug. 19, 1858, Dr. Fraill Greene; In spruce swamp, Tobyhanna, Aug. 29, 1919, E. M. G. Schuylkill: Porter's Flora.



Fig. 124. *Calamagrostis porteri* (Porter's Reed Grass).

2. CALAMAGROSTIS PORTERI Gray.

[Fig. 124]

Porter's Reed Grass.

Culms slender, 6-12 dm. high, smooth, simple; sheath shorter than the internodes, a pubescent ring at the summit; ligule 3-5 mm. long; blades 1.5-3 dm. long, 4-8 mm. wide, rough; panicle narrow, 8-16 cm. long, branches erect; spikelets 4-5 mm. long; glumes unequal, acute, longer than the floret; lemma awned from near the base, awn longer than the lemma, twisted below when dry; palea about equal to the lemma; callus hairs few, about $\frac{1}{3}$ as long as the lemma. August-September.

This grass is found in dry woods. It is rare in Pennsylvania. Its distribution is not extensive, being reported only from New York to Florida.

Distribution in Pennsylvania.

Huntingdon: Blairs Mills, Aug. 2, 1922, E. M. G.; Pulpit Rocks, August, 1864, T. C. Porter. Lackawanna: Moosic Lake, Flora Northeastern Pennsylvania. Monroe: Naomi Pines.



Fig. 125. *Calamagrostis canadensis* (Blue-joint grass). A. Inflorescence; B. Spikelet.

3. CALAMAGROSTIS CANADENSIS (Michx.) Beauv.

[Fig. 125]

Blue-joint Grass.

Arundo canadensis Michx.*Calamagrostis canadensis* var. *acuminata* Vasey.

Root-stock present, culms 6-15 dm. high, clustered, erect, simple, usually smooth; sheath shorter than the internode; blades 1.5-4 dm. long, 2-8 mm. wide, glaucous, scabrous, somewhat involute in drying; panicle 1-3 dm. long, often purplish, the slender fascicled branches ascending or spreading; spikelets 3-3.5 mm. long; glumes equal or nearly so, acute, slightly longer than the floret; lemma thin, awn difficult to distinguish from the copious basal hairs which are about as long as the lemma. June-August.

This grass is found in swamps and wet places. It makes good hay and is a valuable grass for low, wet meadows. It is distributed from eastern Quebec to New Jersey and westward through northern United States to British Columbia.

Distribution in Pennsylvania.

Bucks, Carbon: Porter's Flora. Crawford: Hartstown, Aug. 1, 1918, E. M. G.; July 3, 1886, B. H. P. Dauphin, Delaware, Elk: Porter's Flora. Erie: Presque Isle, June 26, 1879, Guttenberg. Lancaster, Monroe, Northampton: Porter's Flora. Perry: Shermandale, July 22, 1921, E. M. G. Pike: Porter's Flora. Somerset: Stoystown, July 23, 1885, B. H. P. Tioga, Venango: Porter's Flora.



Fig. 126. *Calamagrostis inexpansa*. A. Inflorescence; B. Spikelet.

4. CALAMAGROSTIS INEXPANSA Gray.

[Fig. 126]

Calamagrostis confinis Gray, [not Nutt.]

Culms slender, erect, solitary or few, 7-12 dm. high; sheaths smooth; blades 1.5-3 dm. long, 3-5 mm. wide, rough, flat but often involute in drying; panicle narrow, not very densely flowered; spikelets 4 mm. long; glumes rather rigid, pointed, longer than the floret; lemma rough, toothed, awn scarcely exceeding the lemma, callus hairs about $\frac{2}{3}$ as long as the lemma. July-August.

Found in swamps and low wet places in New York and New Jersey westward to South Dakota and Colorado. The only record from western Pennsylvania is from Erie County. This specimen was collected August 24, when the grass had been ripe for some time, most of the florets having dropped out.

Distribution in Pennsylvania.

Erie: Presque Isle, Aug. 24, 1905, O. E. J. Lycoming: In bog near Muncy, Porter's Flora.

32. AGROSTIS L.

Bent Grass.

[Hitchcock, A. S., North Amer. Species of Agrostis. U. S. Dept. of Agr. Bur. Plant Ind. Bull. 68. 1905, Piper, Charles V., The Agricultural Species of Bent Grasses. U. S. Dept. of Agr. Bull. 692, 1918.]

Annual or perennial grasses with flat or setaceous leaves and open or contracted panicles. Spikelets numerous, small, 1-flowered; glumes subequal, membranous, keeled, acute; lemma broad, obtuse, awnless or dorsally awned, shorter than the glumes; palea hyaline, shorter than the lemma, sometimes minute or wanting; grain free, loosely enclosed in the lemma.

Palea present.

Palea nearly equaling the lemma which bears a long awn inserted just below the bifid apex1. *A. spica-venti*.

Palea about 1/2 as long as the lemma.

Lemma awnless.

Culms erect or decumbent at base.

Culms 50-100 cm. tall; panicle large and many flowered, usually closing after flowering.2. *A. palustris*

Culms usually less than 50 cm. tall; panicles small, rather few-flowered, remaining open and spreading after flowering.4. *A. capillaris*

Culms prostrate, rooting at the nodes; panicle narrow, almost spike-like.3. *A. maritima*.

Lemma awned from near the base.5. *A. capillaris* var. *aristate*.

Palea wanting or minute.

Lemma awnless.

Panicle diffuse, usually purplish, branches long and capillary, dividing toward the end.6. *A. hiemalis*.

Panicle spreading but not diffuse, usually pale green, branches dividing below the middle.7. *A. perennans*.

Lemmas awned from about the middle8. *A. canina*



Fig. 127. *Agrostis spica-venti* (Silky Bent Grass). A. Inflorescence; B. Spikelet.

1. AGROSTIS SPICA-VENTI L.

[Fig. 127]

Silky Bent Grass. Windlestraw.

Apera spica-venti (L.) Beauv.

A tufted annual; culms 3-7 dm. high, slender, erect, smooth and glabrous; sheaths smooth; blades 3-15 cm. long, 1-5 mm. wide, scabrous; panicle 1-3.5 dm. long, branches very slender, verticillate, spikelet-bearing toward the ends; spikelets 2-3 mm. long; glumes 2-3 mm. long, narrow, acute; lemmas a little shorter than the upper glume, bearing an awn 1-2 cm. long, 2-toothed. June-July.

This grass is found in waste places and on ballast from Maine to southern New York and Pennsylvania. It is a native of Europe. It is included in the genus *Apera* by many authors. See Hitchcock, The Genera of Grasses of the U. S., U. S. Dept. of Agr. Bull. 772: 130-132. 1920.

Distribution in Pennsylvania.

Cambria: Johnstown, July 3, 1887, B. H. P. "Escaped in Garden".
 Philadelphia: Porter's Flora and Flora of Philadelphia and Vicinity.



Fig. 128. *Agrostis palustris* (Redtop). A. Inflorescence; B. Spikelet.

2. AGROSTIS PALUSTRIS Huds.

[Fig. 128]

Redtop.

Agrostis alba [of authors not L.]

Culms 3-10 dm. high from creeping rootstock, often decumbent at base; sheath smooth; blades 8-16 cm. long, 2-6 mm. wide, slightly rough; ligule membranous, 2-5 mm. long; panicle 5-30 cm. long, spreading, contracted after flowering, greenish, purplish, or brownish; spikelet 2-2.5 mm. long; glumes acute, the first scabrous on the keel, the second a little smaller and smooth or rough near the apex; lemma a little shorter than the glumes, rarely short awned; palea about half as long as the lemma. June-September.

Red top is common throughout the state, and is cultivated as a meadow and pasture grass in the Northern States. It is grown especially upon soils lacking lime, and those too wet for timothy. It is so common in Pennsylvania that the distribution by counties is omitted.

3. AGROSTIS MARITIMA Lam.

Agrostis alba maritima (Lam.) Meyer.

This variety has densely tufted, prostrate culms rooting at the nodes, short appressed leaves and a dense, contracted, narrow panicle.

It is found in brackish meadows or wet sands along the coast from Maine to Delaware. It has been reported as having been collected on ballast from Philadelphia. Several plants which the writer identified as this variety were found on a dumping ground in Scranton, Pa., August 26, 1920.

Distribution in Pennsylvania.

Lackawanna: Vacant lot, Scranton, Aug. 26, 1920, E. M. G. Philadelphia: Ballast, near Philadelphia, July 7-17, 1897, Benjamin Heritage; also Aug. 1878, collector unknown.

4. AGROSTIS CAPILLARIS L.

Rhode Island Bent
A. vulgaris With.
A. alba vulgaris Thurb.

Culm upright, rather slender, usually less than 50 cm. high, and often tufted; rhizomes short or none; leaf blades ascending, 5-10 cm. long, 1-2 mm. wide; ligule obtuse, 1-2 mm. long; panicle loose, 5-12 cm. long, branches slender and more spreading than in *A. palustris* which it resembles very closely. The spikelets are similar to those of *A. palustris*.

It is difficult to list the distribution of this species in Pa. due to the fact that it has been confused with (*A. alba*) *A. palustris*, a species of which it is made a variety by some authors.

5. AGROSTIS CAPILLARIS ARISTATA (Gray.) n. comb.

A. stricta Willd.
A. alba aristata Gray.

In general appearance this plant is very similar to that of *A. capillaris* but the lemma bears a distinct, straight awn from near the base which is longer than the glumes. It is often confused with *A. canina* which bears a bent awn inserted about the middle of the lemma.

It is not common in Pennsylvania. The writer in company with Dr. O. E. Jennings and Mrs. Jennings collected it at Tobyhanna, Monroe Co., August 10, 1920.



Fig. 129. *Agrostis hiemalis* (Hair Grass). A. Inflorescence; B. Spikelet.

6. *AGROSTIS HIEMALIS* (Walt.) B. S. P.

[Fig. 129]

Hair Grass.

Cornucopiae hyemalis Walt.*Agrostis scabra* Willd.

Usually an annual; culms slender, erect or somewhat bent at the lower joints, 3-6 dm. high; leaves short and narrow, the tufted basal ones soon involute-setaceous, the upper ones 2-8 cm. long and 1-1.5 mm. wide, scabrous, especially on the margin; panicle long and lax, often purplish, the capillary, whorled, scabrous branches bearing spikelets toward the ends; spikelets 1.5-2 mm. long; glumes acute with a scabrous keel, nearly equal; lemma awnless or rarely short-awned, shorter than the glumes; palea none.

This is a common grass and found on almost any kind of soil from June to September. It is one of our tumble grasses, the panicle being broken off and blown by the wind. It has a wide distribution, being found throughout North America except in the far north. It is found also in Siberia and Australia. It is so common that the distribution in the State is omitted.

AGROSTIS ANTECEDENS Bick.

Bull. Torr. Bot. Club 35: 473. 1908.

Bicknell has separated from *Agrostis hiemalis* a new species which he calls *Agrostis antecedens*. There are specimens in the Herbarium of the Philadelphia Academy of Science from Bucks, Chester, Delaware, Lancaster, Montgomery, and Philadelphia Counties. The characters seem not to be constant.



Fig. 130. *Agrostis perennans* (Thin Grass). A. Inflorescence; B. Spikelet.

7. *AGROSTIS PERENNANS* (Walt.) Tuckerm.

[Fig. 130]

Thin Grass.

Agrostis intermedia Scribn.*Agrostis scribneriana* Nash.

A perennial with commonly a weak, lax, leafy culm, erect or ascending from a decumbent base, 3-10 dm. high; sheaths smooth; ligule about 2 mm. long; blade flat, thin, scabrous, about 2 mm. wide and 8 cm. long; panicle oblong, the slender

branches in clusters of 2-5 at a node, dividing and spikelet bearing from about the middle; pedicels divergent; spikelet 2-3 mm. long, pale green; glumes unequal, acute; lemma a little shorter than the glumes; palea none or minute. August-October.

This grass has a wide distribution in the U. S., extending from New England to Montana and southward. It is very variable in form, depending upon the conditions under which it grows. In open places the culms are tufted, stiff and erect, with more or less ascending branches of the panicle. In shaded, or damp places, the culm and leaves are lax and weak, the panicle with fewer more divaricate branches. It is so common in Pennsylvania that the distribution by counties may be omitted.

AGROSTIS PERENNANS AESTIVALIS Vasey.

Agrostis schweinitzii Trin.

Agrostis orophila Trin.

This plant is probably only the form of *A. perennans* which is found growing in damp shaded places. It is common in damp woods and may be found in integrading forms between the variety and the species.

AGROSTIS PERENNANS ELATA (Pursh.) Hitchc.

A. elata Trin.

A. altissima Tuckerm.

This variety differs from the species in having more slender elongated culm, with the spikelets crowded toward the ends of the branches, thus giving them a more drooping appearance. It is reported by Porter (Porter's Flora) from Montgomery Co., Pa.



Fig. 131. *Agrostis canina* (Velvet Bent Grass. Brown Bent Grass).

8. AGROSTIS CANINA L.

[Fig. 131]

Brown Bent Grass, Velvet Bent Grass.

A delicate, erect, slender grass from 2-6 dm. high; lower leaves involute-setaceous, the upper ones a little broader and flat; panicle narrow and contracted in fruit, often very red or purplish; glumes nearly equal and acute; lemma thin, hyaline, with an awn inserted about the middle or below which is bent and longer than the glumes; palea wanting.

This grass is a native of Europe and is sparingly introduced into the U. S. Piper says, "The patches of turf made by single plants of velvet bent are often a foot or more in diameter and make what is probably the finest of all grass turfs."

Distribution in Pennsylvania.

Allegheny: Castle Shannon, June 28, 1918. Wm. Smith. Blair: Porter's Flora. Cambria: Cresson, July 25, 1861. J. R. Lowrie, (Porter's Herb.). Dauphin, Northampton: Porter's Flora.

33. AMMOPHILA Host.

Beach Grass.

Coarse perennial grasses with long creeping root-stocks, flat leaf blades, convolute in drying, and dense spike-like panicles. Spikelets 1-flowered; rachilla prolonged behind the palea into a hairy bristle; glumes firm, compressed-keeled, acute, lower 1-nerved, upper 3-nerved; lemma firm, 5-nerved, with a ring of hairs at the base, 2-toothed and mucronate between the teeth; palea rather firm, its two nerves close together; grain free, loosely enclosed in the lemma and palea.



Fig. 132. *Ammophila breviligulata* (Beach Grass). A. Inflorescence; B. Spikelet; C. Floret.

AMMOPHILA BREVILIGULATA Fernald.

[Fig. 132]

Rhodora 22:70-71. 1920.

Beach Grass, Sand Reed, Psamma, Marram.

Plants similar to the European species, *A. arenaria* (L.) Link; culms 5-10 dm. high, stout, erect, rigid, smooth, from a long, horizontal, branching root-stock; sheaths smooth, the lower ones short and overlapping; blades long, soon involute, serrulate-scabrous along the nerves on the upper surface; ligule chartaceous or coriaceous, rounded, 1-3 mm. long; panicle spike-like, 1.5-4 cm. long, rachis puberulent; glumes nearly equal, scabrous especially on the keel; lemma slightly bidentate, a ring of hairs at the base, caryopsis 3.2-3.6 mm. long. August-September.

This grass is found along the sandy shores of America from the Straits of Belle Isle to North Carolina, also along the St. Lawrence River and around the Great Lakes. It has been identified as *Ammo-*

phila arenaria (L.) Link., the Old World species, which is found in America only on the Pacific Coast, where it has been introduced recently as a sand binder.

Fernald, op. cit., has observed that our Atlantic American plant differs in many ways from the European species and has, therefore, called it *Ammophila breviligulata*.

Distribution in Pennsylvania.

Erie: East end of Presque Isle, Aug. 5, 1880, Guttenberg; Presque Isle, Sept. 9-12, 1900, J. A. S.; Aug., 1919, E. M. G.

34. SPHENOPHOLIS Scribn.

Eatonia Endlich.

Eaton Grass.

Slender tufted perennial grasses with flat or involute leaves and narrow terminal panicles. Spikelets 2-3 flowered, rachilla extended beyond the uppermost palea into a slender pedicel, articulated between the florets, also more persistently below the glumes; lower glume linear, acute, 1-nerved, the upper one much broader, obovate, 3-nerved, margins scarious; lemma chartaceous, nerves obscure, awnless; palea narrow, hyaline; grain free, enclosed in the lemma and palea.

Glumes about equal in length.

Lower glume about $\frac{1}{6}$ as wide as the upper one, panicle narrow and densely flowered1. *S. obtusata*.

Lower glume about $\frac{1}{3}$ as wide as the upper one, panicle lax, branches more or less spreading2. *S. nitida*.

Glumes unequal in length; lower $\frac{1}{2}$ - $\frac{3}{4}$ as long as the broader second3. *S. pallens*.



Fig. 133. *Sphenopholis obtusata*.

1. SPHENOPHOLIS OBTUSATA (Michx.) Scribn.

[Fig. 133]

Aira obtusata Michx.

Eatonia obtusata Gray.

Eatonia pubescens Scribn. & Merr.

Sphenopholis obtusata var. *pubescens* (Scribn. & Merr.) Scribn.

Culms tufted, 3-10 dm. high, simple, smooth; sheaths smooth or pubescent, usually shorter than the internodes; ligule about 2 mm. long; blades 4-15 cm. long, 2-8 mm. wide, slightly scabrous, sometimes downy; panicles 6-8 cm. long, densely flowered, not spreading; spikelets 2.5-3 mm. long; glumes about equal, the lower one narrow, linear, the second broadly obovate, obtuse, margin smooth and shiny; lemma similar in texture to the glumes; palea thin and transparent. June-August.

This species is found on dry soil from Connecticut to Florida and westward. *Sphenopholis obtusata* var. *lobata* (Trin.) Scribn., has a very dense, spike-like panicle. It is found on dry soil and prairies from Maine to Florida and westward. A specimen in the Herb. Phila. Acad. Sc., collected from Lehigh County, June 22, 1912, by Daniel W. Hamm, has been identified as var. *lobata*.

Distribution in Pennsylvania.

Allegheny: Swissvale, May 30, 1890, B. H. P.?; Evergreen, June 3, 1886, B. H. P.? Bucks: Flora of Phila. and Vicinity. Chester, Delaware: Herb. Phila. Acad. Sc., Pennell. Lancaster: Herb. Phila. Acad. Sc., Jas. Galen; Rawlinsville, June 6, 1922, E. M. G. Lehigh: Herb. Phila. Acad. Sc., Pretz. Montgomery: Herb. Phila. Acad. Sc., Long & Pretz.



Fig. 134. *Sphenopholis nitida* (Slender Eaton Grass).

2. SPHENOPHOLIS NITIDA (Spreng.) Scribn.

[Fig. 134]

Slender Eaton Grass.

Aira nitida Spreng.

Eatonia dudleyi Vasey.

Eatonia nitida Nash.

Eatonia glabra Nash.

Culms slender, 3-6 dm. high, erect, smooth; sheaths generally pubescent; blades 3-6 cm. long, 2-5 mm. wide, often pubescent, uppermost very short; panicle 5-20 cm. long, loosely flowered, spreading when in flower, contracted afterwards; spikelets 3 mm. long; glumes *about equal*, the second one broad and obtuse; lemma obtuse, rarely short-awned just below the apex. May-June.

This species is found in woods from Vermont to Michigan and southward.

Distribution in Pennsylvania.

Bucks, Delaware: Porter's Flora. Franklin: Edenville, May 24, 1922, E. M. G. Huntingdon: Porter's Flora. Lancaster: July, 1884, Jas. Galen. Lehigh, Monroe, Northumberland: Porter's Flora. Philadelphia: Wissahickon, Flora of Phila. and Vicinity. Westmoreland: Jacob's Creek, May 30-31, 1902, J. A. S. and O. P. Medsger; Hillside, June 12, 1920, E. M. G.

3. SPHENOPHOLIS PALLENS (Spreng.) Scribn.

[Fig. 135]

Eaton Grass.

Aira pallens Spreng.

Eatonia pennsylvanica Gray.

Culms 3-10 dm. high; sheaths usually glabrous, sometimes pubescent; blades 5-20 cm. long, 4-6 mm. wide, scabrous, sometimes slightly pubescent; panicle lax, 8-20 cm. long, loosely flowered branches more or less spreading; spikelets 3-4 mm. long, oblong-lanceolate; glumes *unequal*, the lower one linear, and about $\frac{3}{4}$ as long as the broadly oblanceolate second one; lemmas lanceolate, acute, glabrous, except on the keel near the apex. June-July.

This species is found in hilly woods or moist soil from Newfoundland west to British Columbia and southward. This is the species most commonly found in the state.

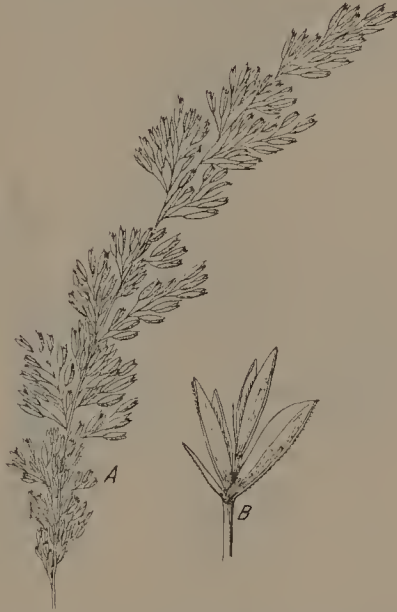


Fig. 135. *Sphenopholis pallens* (Eaton Grass). A. Inflorescence; B. Spikelet.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 15, 1918, E. M. G. Bucks, Chester, Delaware: Herb. Phila. Acad. Sc. Jefferson: Porter's Flora. Lancaster, Lehigh, Montgomery, Northampton: Herb. Phila. Acad. Sc. Philadelphia: Porter's Flora. Somerset: Stoystown, June 18, 1877, B. H. P.; July 2-5, 1878, B. H. P. Tioga: Porter's Flora.

35. KOELERIA Pers.

Koeler's Grass.

Crested Hair Grass.

Tufted perennial grass with flat narrow leaves and densely flowered terminal spike-like panicles. Spikelets 2-4-flowered; rachilla prolonged behind the upper palea into a naked pedicel; glumes unequal, narrow, acute, keeled, the lower 1-nerved, the upper one 3-nerved, margins scarious; lemmas faintly 3-5-nerved, acute or mucronate; palea hyaline; grain free, enclosed in the lemma and palea.

KOELERIA CRISTATA (L.) Pers.

[Fig. 136]

Crested Hair Grass.

Aira cristata L.

Koeleria nitida Nutt.

Koeleria cristata var. *gracilis* Gray.

Culms tufted, 3-6 dm. high, rigid, often densely short pubescent just below the panicle, leafy at the base; sheaths retrorsely pubescent or smooth; blades 3-30 cm. long, flat or involute; panicle 4-15 cm. long, contracted or spike-like, usually pale-green, often interrupted at the base; spikelets 2-5 flowered, 4-6 mm. long; glumes unequal, acute, slightly shorter than the florets; lemmas 2-5 mm. long, scabrous, shining. July-September.

This grass which is very valuable is found on dry sandy soil from Ontario to British Columbia, south to Pennsylvania, Texas and California; also in Europe, Asia, South America, Australia and New Zealand. The spike-like panicles resemble those of timothy but are more interrupted and not so cylindrical, and often much thicker. It is a valuable pasture grass in the west on the dry sandy soils and prairies.



Fig. 136. *Koeleria cristata* (Crested Hair Grass). A. Inflorescence; B. Spikelet.

Distribution in Pennsylvania.

Lackawanna: Porter's Flora. Reported from Campbell's Ledge by Twining, Flora of Northeastern Pennsylvania.

36. *ARRHENATHERUM* Beauv.

'Tall Oat Grass.

Tall perennial grasses with flat leaves and long contracted or open panicles. Spikelets 2-flowered, the florets close together, the lower one staminate, the upper one perfect; rachilla prolonged behind the upper palea into a bristle; glumes unequal, acute, thin and scarious; lemma of the lower staminate floret bearing a bent and twisted awn from near the base, the lemma of the upper perfect floret awnless (sometimes short-awned); palea ciliate on the nerves.

ARRHENATHERUM ELATIUS (L.) Beauv.

[Fig. 137]

Tall Oat Grass.

Avena elatior L.

Arrhenatherum avenaceum Beauv.

Arrhenatherum elatius Beauv.

Culms 1 m. or more high, erect, simple; blades long, linear, 5 mm-1 cm. wide, scabrous on both surfaces; panicle pale, becoming somewhat lead-colored or purplish and shining, 15-30 cm. long, about 2 or 3 cm. wide; branches verticillate; spikelets 7-8 mm. long; glumes minutely scabrous, second about 8 mm. long, the first shorter; lemma scabrous, awn of the staminate floret about twice the length of the lemma; palea about as long as the lemma. June-July.

Found in fields and waste places rather generally throughout the U. S. Cultivated in places, although it has never met with favor as a forage plant.



Fig. 137. *Arrhenatherum elatius* (Tall Oat Grass). A. Inflorescence; B. Spikelet.

Distribution in Pennsylvania.

Allegheny: Centre and Bellfield Ave., Pittsburgh, June 19, 1918, E. M. G.; Edgewood, June 19, 1918, E. M. G.; Oakland, Pittsburgh, Oct. 9, 1885, B. H. P. Chester, Lancaster: Porter's Flora. McKean: Kane, Sept. 8, 1920, O. E. J. Monroe: East Stroudsburg, Aug. 3, 1920, E. M. G., O. E. J. Northampton: Porter's Flora. Somerset: Stoystown, June 7, 1878, B. H. P.

37. NOTHOLCUS Nash.

[*Holcus* of Authors.]

Velvet Grass.

Perennial grasses with flat leaves and terminal panicles. Spikelets articulate below the glumes, 2-flowered, the lower one perfect, the upper one staminate (rarely perfect), its lemma bearing a hook-like dorsal awn; glumes membranous, keeled, the lower one 1-nerved, the upper one 3-nerved, sometimes short awned; lemma thin; paleas thin, nearly as long as the lemmas; grain free, enclosed in the lemma and palea.



Fig. 138. *Notholcus lanatus* (Velvet Grass).

NOTHOLCUS LANATUS (L.) Nash.

[Fig. 138]

Velvet Grass.

Holcus lanatus L.

A whitish or grayish, velvety-pubescent plant; culms erect, 3-6 dm. long; upper sheaths shorter than the internodes, pubescent; ligule 1-3 mm. long, membranous; blades 4-15 cm. long, 5-10 mm. wide, pubescent; panicle 5-10 cm. long, whitish or pinkish tinted; spikelets 2-flowered, about 4 mm. long; glumes longer than the floret, second slightly longer and much broader with 3 prominent, hirsute nerves; lemma ciliate at apex, lower one slightly obtuse, upper one bearing a hooked awn just below the apex. June-August.

This grass is found in fields, meadows, waste places and lawns from Nova Scotia to Illinois and southward. It is naturalized from Europe. It is in favor as a forage grass in some places but in general is not considered of much value as such. The grass is very pretty with its pale green or whitish foliage and pink tinged panicles and might well be used more for ornamental purposes.

Distribution in Pennsylvania.

Allegheny: Common. Bucks: Porter's Flora. Cambria: Johnstown, June 7, 1874, B. H. P. Chester: Porter's Flora. Crawford: Conneaut Lake, July 23-25, 1901, J. A. S. Delaware, Erie, Franklin: Porter's Flora. Indiana: East of Blairsville Intersection, Aug. 8, 1901, J. A. S. Jefferson, Lancaster, Luzerne, Northampton, Philadelphia, Somerset: Porter's Flora. Westmoreland: Mt. Pleasant Twp., Aug. 11, 1902. J. A. S.; Idlewild, June 7, 1912, John Bright.

38. DANTHONIA DC.

Wild Oat Grass.

Tufted erect perennials with narrow leaves and small terminal panicles or racemes. Spikelets 2-several-flowered, florets all perfect or the uppermost staminate or rudimentary; rachilla prolonged beyond the florets; glumes subequal, much longer than the lemmas, usually extending beyond the uppermost floret; lemmas 2-toothed, a flat twisted awn from between the teeth; palea hyaline; grain free, enclosed in the palea.

Teeth of the lemma triangular and pointed but not awned.1. *D. spicata*.

Teeth of the lemma slender and awned or long pointed.

Floret exclusive of awn not over 5 mm. long.2. *D. compressa*.

Floret exclusive of awn 7-8 mm. long.3. *D. sericea*.

1. DANTHONIA SPICATA (L.) Beauv.

[Fig. 139]

Common Wild Oat Grass.

Avena spicata L.

Culms 2-7 dm. high, erect, simple, glabrous, terete; sheaths shorter than the internodes, glabrous or sparingly pubescent, the numerous basal leaves have a tuft of long hairs at the summit of the sheath; blades of basal leaves usually involute and curled, upper ones flat and erect; inflorescence spike-like raceme or panicle, 2-5 cm. long; spikelets 5-8 flowered, 10-12 mm. long; glumes glabrous, 8-12 mm. long; lemma 4-5 mm. long, oblong, sparingly pubescent with appressed silky hairs, terminated by two short (1 mm.) triangular teeth, with a bent twisted awn about 5 mm. long between the teeth. This species of *Danthonia* produces cleistogamous spikelets at the base of the lowermost sheaths.¹ June-August.

This is a very common grass on acid soil in open oak woods and old sterile fields. Most farmers know the soil, on which this white, curly grass grows is not fertile. The sterility may be due to excess acid which can be corrected by the use of lime. It is found from Newfoundland to South Dakota and southward to North Carolina and Texas.

¹Agnes Chase, Axillary Cleistogenes in Some American Grasses, American Journal of Botany V: 254-258, 1918.



Fig. 139. *Danthonia spicata* (Common Wild Oat Grass). A. Inflorescence; B. Spikelet; C. Lemma.

Distribution in Pennsylvania.

Allegheny: Glenshaw, July 12, 1918, E. M. G.; Stoops Ferry, Moon Twp., July 5, 1901, J. A. S. Bucks; Porter's Flora. Cambria: Johnstown, June 27, 1874, B. H. P. Centre: Barrens near Scotia, July 14, 1919, O. E. J. Crawford: Hartstown, Aug. 1, 1918, E. M. G. Delaware: Porter's Flora. Erie: Presque Isle, July 10, 1879, Guttenberg. Franklin: Porter's Flora. Lancaster: 1886, Jas. Galen. Lycoming: Porter's Flora. Monroe: Near Pocono Knob, July 4, 1896, N. L. Britton. Montgomery: Porter's Flora. Northampton: Chestnut Hill, Easton, June 14, 1898, Porter. Philadelphia, Wayne: Porter's Flora.



Fig. 140. *Danthonia compressa* (Flattened Wild Oat Grass). A. Spikelet; B. Lemma.

2. *DANTHONIA COMPRESSA* Aust.

[Fig. 140].

Flattened Wild Oat Grass.

Culms 3-9 dm. high, erect, simple, glabrous, flattened; sheaths shorter than the internodes, tuft of hairs at the summit, otherwise smooth; blades narrow, basal

one shorter and more narrow and curly than the upper culm leaves; panicle usually more open and spreading than that of *D. spicata*; spikelets and florets much like those of *D. spicata*, except that the teeth of the lemma are much longer (2-3 mm.) and more slender and pointed or awned. June-September.

Found in dry woods from Maine to New York, south to North Carolina and Tennessee. Not common in western Pennsylvania.

Distribution in Pennsylvania.

Berks, Erie, Jefferson, Lackawanna, Lycoming, Monroe, Pike, Somerset: Porter's Flora. Sullivan: No location, June 27, 1902, Benj. H. Smith. Wayne: Irving Cliff, Honesdale, Aug. 21, 1920, E. M. G., O. E. J., G. K. J. Westmoreland: Sandy soil near river, Idlewild, Sept. 21, 1907, D. R. Sumstine.



Fig. 141. *Danthonia sericea* (Silky Wild Oat Grass).

3. DANTHONIA SERICEA Nutt.

[Fig. 141]

Silky Wild Oat Grass.

Culms 5-9 dm. high; sheaths villous; basal leaves long, involute, culm leaves short, all more or less villous; panicles 6-10 cm. long, contracted, branches usually erect or ascending; spikelets 4-10-flowered; glumes 14-16 mm. long, narrow, pale, acuminate; lemmas densely covered with long, silky hairs, teeth about $\frac{1}{3}$ the length of the lemma, slender or awn-like; awn 1-1.5 cm. long, usually bent, twisted below. May-July.

This species is found in dry, sandy soil from Massachusetts to Pennsylvania and southward to Florida and Mississippi. It is rare in Pennsylvania. No specimen from the state has been seen and the only place from which it is known to be reported is Lycoming County (Porter's Flora).

39. AVENA L.

Oats.

Annual or perennial grasses with usually flat leaves and terminal panicles of large spikelets. Spikelets 2-6 flowered, the lower florets perfect, the upper often staminate or imperfect; rachilla bearded below the florets; glumes subequal, membranaceous, many-nerved, longer than the lemmas, usually exceeding the uppermost floret; lemmas indurated toward the base, rounded on the back, acute, generally bearing a dorsal awn, apex often 2-toothed; palea narrow, 2-toothed; grain enclosed in the lemma and palea, often adherent to them.

Lemma covered with long hairs which become more numerous and brown toward the base 1. *A. fatua*.
 Lemma smooth, awnless or imperfectly awned 2. *A. sativa*.

Fig. 142. *Avena fatua* (Wild Oats).

1. AVENA FATUA L.

[Fig. 142]

Wild Oats.

An erect glabrous annual; culms 4-12 dm. high, stout; sheaths usually smooth; blades 4-20 cm. long, 5-10 mm. wide, slightly rough; panicle large, loose, branches ascending; spikelets 2-2.5 cm. long, pendulous; glumes smooth, striate, pointed; lemma covered with long hairs which become more numerous and brown toward the base; the bent awn inserted near the middle, and twisted below, about 3 cm. long. June-September.

Found as a weed in fields and waste places in Ontario, Wisconsin and westward. It is common along the Pacific coast where it is highly valued as a forage crop.

Distribution in Pennsylvania.

Delaware: Near Chester, July 23, 1920, E. M. G. Monroe: Tobyhanna, Aug. 12, 1920, E. M. G., O. E. J., G. K. J. Philadelphia: Broad St., June 26, 1879, Boice.

2. AVENA SATIVA L.

Common Oats.

A smooth annual; culms reaching a height of 1 m.; sheath smooth; blades flat, slightly scabrous; panicle loose, 10-25 cm. long, branches erect; spikelets about 2 cm. long; glumes unequal or nearly equal, broad, acute; lemma smooth, indurated, enwrapping the grain, awnless or with an imperfect awn.

This is our common cultivated oats. It is frequently found in vacant lots and waste places about cities. It sometimes persists in old fields where it has been cultivated. Could probably be found in such places mentioned under *A. fatua*, in any county in Pennsylvania.

40. TRISETUM Pers.

False Oats.

Tufted perennial grasses with spike-like or open panicles. Spikelets 2-5 flowered, all perfect or the uppermost staminate; rachilla extended beyond the uppermost palea; glumes unequal, keeled; lemma membranaceous, keeled, 2-toothed, bearing a slender dorsal awn; palea narrow, 2-toothed; grain free, enclosed in the lemma and palea.

Lemmas all bearing long dorsal awns1. *T. spicatum*.
Lower lemma awnless or sometimes bearing a short rudimentary awn. 2. *T. pennsylvanicum*.



Fig. 143. *Trisetum spicatum* (Narrow False Oats).
A. Inflorescence; B. Spikelet.

1. TRISETUM SPICATUM (L.) Richter.

[Fig. 143]

Narrow False Oats.

Aira spicata L.

Aira subspicata L.

Avena mollis Michx.

Trisetum subspicatum Beauv.

Culms slender, erect, 1.5-6 dm. high, softly pubescent or glabrous; sheaths usually shorter than the internodes, more or less puberulent; blades 2-10 cm. long, 1-3 mm. wide; panicles spike-like, shining, often interrupted below; spikelets 5-6 mm. long, 2-3 flowered; glumes about 5 mm. long, second broader and a little longer; lemmas 4-5 mm. long, acuminate, scabrous, each bearing a long bent and somewhat twisted awn, inserted about $\frac{1}{3}$ below the acuminate-toothed apex. July-September.

This species is found in mountains and rocky banks from Labrador to Alaska and south to Connecticut, New York, the Great Lakes, and on the mountains to North Carolina, New Mexico and California. Rare in Pennsylvania.

Distribution in Pennsylvania.

Lehigh: June 23, 1918, Pretz; July 15, 1917, Pretz. [See Pretz, Harold W., Discovery of *Trisetum spicatum* in Penna. Rhodora, July, 1919.]

2. TRISETUM PENNSYLVANICUM (L.) Beauv.

[Fig. 144]

Marsh Oat Grass.

Avena pennsylvanica L.

Avena palustris Michx.

Trisetum palustre Torr.

Sphenopholis palustris (Michx.) Scribn. Rhodora 8: 145, 1908; Gray's Manual ed. 7: 139, 1908.

Sphenopholis pennsylvanica (L.) Hitchc. Amer. Jour. Bot. 2: 304, 1915.

Culms 6-10 dm. high; sheaths shorter than the internode, somewhat scabrous, or the lower ones sometimes pubescent; ligule 1 mm. long; blades 2-15 cm. long, 2-6

mm. wide, scabrous; panicles 5-20 cm. long, narrow, branches ascending; spikelets 6-7 mm. long, 2-flowered; glumes subequal, lanceolate, acute, 4-5 mm. long; lemmas 4-5 mm. long, the first awnless or rarely short-awned, the second with a twisted, bent awn 4-5 mm. long, from below the acute or 2-toothed apex. June-July.



Fig. 144. *Trisetum pennsylvanicum* (Marsh Oat Grass).
A. Inflorescence; B. Spikelet.

This species is found in swamps and wet meadows from Massachusetts to Illinois, and south to Florida and Louisiana.

Distribution in Pennsylvania.

Bucks, Chester: Herb. Phila. Acad. Sc. Cumberland: Doubling Gap, along mountain stream, May 30, 1922, E. M. G. Dauphin: Porter's Flora. Delaware, Lancaster: Herb. Phila. Acad. Sc. Lycoming: Porter's Flora. Montgomery: Herb. Phila. Acad. Sc. Northampton: Porter's Flora. Philadelphia: Herb. Phila. Acad. Sc.

41. AIRA L.

Deschampsia Beauv.

Hair Grass.

Hitchcock, A. S., The Genera of Grasses of the U. S., U. S. Dept of Agr. Bull. 772. 1920.

Tufted perennial grasses with flat or involute leaves and contracted or open panicles of shining spikelets. Spikelets of 2 perfect florets; rachilla prolonged beyond the upper palea as a hairy bristle (rarely terminated by a staminate floret); glumes membranous, keeled, acute; lemmas thin, rounded on the back, truncate, 2-4 toothed, bearing a slender dorsal awn from below the middle; palea narrow; grain free, enclosed in the lemma and palea.

Lemma less than 3 mm. long; leaves flat; florets some distance apart.

1. *A. caespitosa*.

Lemma about 4 mm. long; leaves involute, setaceous; florets close together

2. *A. flexuosa*.

[Note.—See *Weingartneria canescens*, page 150.]



Fig. 145. *Aira caespitosa* (Tufted Hair Grass).

1. AIRA CAESPITOSA L.

[Fig. 145]

Tufted Hair Grass.

Deschampsia caespitosa (L.) Beauv.

Culms 6-12 dm. high, erect, slender, smooth; sheaths shorter than the internodes, smooth; ligule long, membranous; blades 5-15 cm. long, 2-3 mm. wide, flat, basal ones becoming somewhat involute when dry but not setaceous, rough above, smooth beneath; panicles 10-20 cm. long, branches slender, rough, spikelet-bearing near the end, erect or spreading and sometimes flexuous; spikelets 2-flowered (very rarely three), the upper floret some distance above the lower one; glumes shorter than the floret, sometimes slightly longer; lemmas less than 3 mm. long, awned from near the base with a straight awn which is shorter or only slightly longer than the lemma. June-August.

This grass is found in moist places mostly along streams extending from Alaska to Newfoundland and southward to New Jersey and Illinois; along the Rocky Mountains and Sierra Nevada Mountains to New Mexico and California.

Distribution in Pennsylvania.

Bucks, Chester, Delaware, Lancaster, Lehigh: Herb. Phila. Acad. Sc. Monroe: Porter's Flora.

2. AIRA FLEXUOSA L.

[Fig. 146]

Common Hair Grass.

Wavy Hair Grass.

Deschampsia flexuosa (L.) Trin.

Culms 3-8 dm. high, erect, smooth; sheaths shorter than the internodes, smooth or slightly scabrous; blades involute-setaceous, basal ones numerous and much longer (5-15 cm.) than the few short culm ones; panicles 5-20 cm. long, branches slender, ascending or spreading, smooth, flexuous, spikelet-bearing near the ends; spikelets 2-flowered, 4-5 mm. long, florets close together on the rachilla; glumes shorter than the floret, pointed; lemmas about 4 mm. long with an awn from near the base 5-7 mm. long which is bent near the middle and twisted below when dry.

This species is found in dry soil from Greenland and Newfoundland to Ontario and southward to North Carolina and Tennessee. It may be distinguished from *A. caespitosa* by its longer lemma (4 mm.), by its involute-setaceous leaves and by the florets being close together on the rachilla.

Distribution in Pennsylvania.

Bucks, Chester: Herb. Phila. Acad. Sc. Dauphin: Harrisburg, June 5, 1921, E. M. G. Franklin, Lackawanna: Porter's Flora. Lan-

caster: June, 1885, Jas. Galen. Lehigh: Herb. Phila. Acad. Sc. Monroe: Delaware Water Gap, Aug. 5, 1922, E. M. G., O. E. J. Montgomery, Northampton: Herb. Phila. Acad. Sc. Pike: Porter's Flora. [Twining, Flora Northeastern Pennsylvania gives this species as frequent on dry banks in woods.]



Fig. 146. *Aira flexuosa* (Common Hair Grass). A. Inflorescence; B. Spikelet; C. Floret.

42. ASPRIS Adans.

[*Aira* of some Authors.]

Hair Grass.

Delicate annuals with narrow leaf-blades and contracted or open panicles. Spikelets small, 2-flowered, both perfect; glumes thin, acute, subequal, awnless, longer than the approximate florets; lemmas 2-toothed, awned from below the middle, the lower ones sometimes awnless; palea a little shorter than the lemma; grain enclosed in the lemma and palea and usually adherent to them.

Panicle open; lemma about 2 mm. long.1. *A. caryophyllea*.
Panicle contracted; lemma about 3 mm. long.2. *A. praecox*.



Fig. 147. *Aspris caryophyllea* (Silvery Hair Grass).

1. ASPRIS CARYOPHYLLEA (L.) Nash.

[Fig. 147]

Silvery Hair Grass.

Aira caryophyllea L.

Culms slender, erect, or bent at the base, .5-4 dm. high; sheath rather loose, mostly basal; ligule about 3 mm. long, membranous; blades short, setaceous; panicle open, branches spikelet-bearing toward the end; spikelets silvery, shining, about 3 mm. long; glumes about equal, usually whitish, thin, acute, longer than the florets, awnless; lemma of both florets with a geniculate awn 3-4 mm. long, inserted below the middle, teeth setaceous. Introduced from Europe. May-August.

This grass is found in waste places from Nantucket to Ohio and southward. Naturalized from Europe. It is of no agricultural value.

Distribution in Pennsylvania.

Philadelphia: Herb. Phila. Acad. Sc.



Fig. 148. *Aspris praecox*.

2. ASPRIS PRAECOX (L.) Nash.

[Fig. 148]

Aira praecox L.

Culms slender, erect, or geniculate at the base, .5-3 dm. high; sheaths loose, slightly inflated; ligule about 3 mm. long, thin; blades 1-2 cm. long, involute-setaceous; panicle narrow, dense, 1-3 cm. long, the short branches erect; spikelets yellowish, shining, 3-4 mm. long; glumes equal, acute; lemma about 3 mm. long, 2-toothed, bearing a geniculate awn 3-4 mm. long from below the middle. May-July.

Found in sandy soil, N. J. and Delaware to Virginia. Reported only from eastern Pennsylvania.

Distribution in Pennsylvania.

Philadelphia: Bethlehem, Herb. Phila. Acad. Sc.



Fig. 149. *Weingaertneria canescens*.

WEINGAERTNERIA CANESCENS Bernh.

[Fig. 149]

[See F. Lamson-Scribner, American Grasses III, page 91. Bulletin No. 20 (Revised). U. S. Dept. of Agr. 1900.]

A tufted annual grass introduced from Europe. Specimens seen are .5-4 dm. high, with slender culm and slender, smooth, involute leaves, very much crowded about the base; panicle dense, 1-10 cm. long; spikelets two flowered; glumes thin, membranaceous, nearly equal, acute, awnless, about 3 mm. long; lemma

shorter than the glumes, hyaline, awned upon the back below the middle; awn jointed near the middle, the upper portion club-shaped, a ring of short hairs at the joint; palea a little shorter than the lemma, thin, hyaline.

Distribution in Pennsylvania.

A specimen of this grass from Philadelphia, Pa., is in the Herbarium of the Philadelphia Academy of Science.

43. SPARTINA Schreb.

Cord Grass.

Coarse glabrous perennial grasses with strong horizontal rhizomes, rigid culms, long tough leaves, and an inflorescence of one-sided, erect or spreading alternate spikes: spikelets 1-flowered, flattened laterally, sessile, closely imbricated in 2 rows along one side of a continuous rachis, articulated below the glumes; glumes unequal, keeled, acute, or bristle-pointed, the second usually longer than the lemma which is thinner, obtuse and 1-nerved; palea equaling or exceeding the lemma; grain free.

Culms stout, usually over 1 m. high; leaves 1 cm. or more wide, flat or nearly so when fresh; lower glume equaling the lemma1. *S. michauxiana*.

Culms slender, rarely 1 m. high; leaves not over 5 mm. wide, strongly involute when fresh; lower glume about 1/2 as long as the lemma2. *S. patens*.



Fig. 150. *Spartina michauxiana* (Cord Grass). A. Inflorescence; B. Spikelet; C. Rootstock.

1. SPARTINA MICHAUXIANA Hitchc.

[Fig. 150]

Cord Grass.

Spartina cynosuroides (L.) Willd. (Pennsylvania Botanist).

Culms from a stout rootstock, 1-2 m. high, smooth; sheaths overlapping, crowded toward the base; ligule a ring of hairs; blades 6-12 dm. long, 6-15 mm. wide, rough along the margin, stiff and usually involute when dry; spikes 5-30, spreading, 5-10 cm. long; spikelets imbricated on one side of the rachis; glumes unequal, first acuminate, as long or longer than the floret, second one with the awn about twice as long as the first, but very scabrous on the keel; lemmas 7-9 mm. long, scabrous on the keel which does not extend to the apex. August-October.

This coarse grass is found along the banks of rivers and lakes and on wet prairies from Nova Scotia to Saskatchewan and south to New Jersey, Texas and Colorado. On account of its rootstocks it is a good sand binder. If cut before it becomes too old it makes fairly good hay.

Distribution in Pennsylvania.

Allegheny, Bucks, Chester: Porter's Flora. Clarion: Near Foxburg, Aug. 13, 1919, E. M. G. Dauphin: Harrisburg, July 10, 1919, E. M. G. Erie: Presque Isle, Aug. 16, 1919, E. M. G.; Streets of Erie, Aug. 21, 1879, Guttenberg. Fayette: Ohiopyle, Sept. 1, 1901, J. A. S. Huntingdon: Porter's Flora. Lancaster: 1886, Jas. Galen. Philadelphia: Porter's Flora. Venango: Walnut Bend, Aug. 24, 1881, B. H. P. Westmoreland: Jack's Island, Sept. 1897, J. A. S.



Fig. 151. *Spartina patens*. A. Inflorescence; B. Spikelet.

2. SPARTINA PATENS (Ait.) Muhl.

[Fig. 151]

Dactylis patens Ait.

Culms from a slender rootstock, 3-8 dm. high, slender, wiry; sheaths overlapping, crowded; ligule a ring of short hairs; blades 1-3.5 dm. long, 2-4 mm. wide, involute; panicles of 2-10 ascending spikes which are 2-5 cm. long; spikelets 6-8 mm. long; glumes unequal, first about half as long as the second, acute, scabrous on the keel; lemma 5-6 mm. long, slightly emarginate or two-toothed at the apex, exceeded by the palea. July-Sept.

This grass is found in salt marshes and sandy shores along the coast from Newfoundland to Florida and westward to Texas. Gray's manual, 7th ed., gives two varieties,—*Spartina patens* var. *juncea* (Michx.) Hitchc. and *Spartina patens* var. *caespitosa* (A. A. Eaton) Hitchc. Britton and Brown, 2nd ed., gives both as synonyms of the species. The former may be found in the salt marshes in the south-

eastern part of the state. The latter appears to be more northern form. "This species is abundant on the salt-marshes, and in common with black-grass (*Juncus gerardi*) furnishes most of the salt hay that these meadows produce. It is also useful in packing glass-ware, crockery, etc., and is much used for this purpose." Scribner, American Grasses 1: 180. 1900. For salt marsh-grass useful for hay and packing, see Hitchcock, A Text-Book of Grasses p. 40.

Distribution in Pennsylvania.

Philadelphia: Mainly on and near ballast, Porter's Flora; Navy Yards, Herb. Phila. Acad. Sc.

SPARTINA CYNOSUROIDES (L.) Roth.

This species is given by Porter (Porter's Flora) under the name of *Spartina polystachya* (Michx.) Ell. as probably occurring on the lower Delaware. So far as known it has not been collected in the state.

44. CAPRIOLA Adans.

Cynodon Richard.

Bermuda Grass.

Low diffusely branched and extensively creeping perennials, with short flat leaves and slender spikes digitate at the summit of the upright branches. Spikelets 1-flowered, articulated above the glumes, laterally compressed, awnless, sessile in two rows along one side of a slender continuous rachis; glumes unequal, narrow, keeled, acute; lemma broad, boat-shaped, obtuse, ciliate on the keel; palea nearly as long as the lemma, 2-keeled; grain free.



Fig. 152. *Capriola dactylon* (Bermuda Grass).
A. Portion of stolon and stem; B. Inflorescence

CAPRIOLA DACTYLON (L.) Kuntze.

[Fig. 152]

Bermuda Grass.

Panicum dactylon L.

Cynodon dactylon Pers.

Culms branching, stoloniferous, 1-6 dm. high, smooth; sheaths smooth or somewhat pubescent, crowded at the base of the culms and along the stolons; ligule a fringe of white hairs; blades stiff, pointed, 2-8 cm. long, 2-4 mm. wide, smooth beneath, slightly rough above; spikes 3-7, digitate, 2-5 cm. long; spikelets about 2 mm. long, sessile along one side of a slender, flat rachis; glumes unequal, narrow, pointed, hispid on the keel; lemmas longer than the glumes, broad, obtuse, ciliate on the keel; palea as long as the lemma. July-September.

This grass is found in fields and waste places from Massachusetts southward. In the south it is cultivated for pasture, where it occupies relatively the same important position that the blue-grass does in the North. On account of its creeping habit it may become a bad weed in cultivated fields. It usually does not perfect its seeds in the U. S. except in Florida, Arizona, and California; hence it spreads rather slowly and may be kept down by plowing in hot dry weather. It may also be smothered out by rank-growing shade crops such as cowpeas. For further information on Bermuda Grass, see Hitchcock, A Text-book of Grasses. The species is rare in Pennsylvania, having been reported only from the southeastern part of the State.

Distribution in Pennsylvania.

Bucks: Bristol, Porter's Flora. Delaware: Marcus Hook, Porter's Flora. Northampton: Bethlehem, Porter's Flora. Philadelphia: Navy Yards, Herb. Phila. Acad. Sc.

45. DACTYLOCTENIUM Willd.

Crowfoot Grass.

Annual grasses with more or less decumbent and creeping base and 2-6 pointed, one-sided spikes digitate at the end of the culm. Spikelets several-flowered, the uppermost imperfect, sessile and crowded in 2 rows along one side of a continuous rachis, which extends beyond the spikelets in a sharp naked point; glumes broad, keeled, the second cuspidate; lemmas boat-shaped, cuspidate; palea equaling the lemma, acute, deeply folded between the ciliate-winged keels; grain reddish brown, the loose pericarp transversely wrinkled.



Fig. 153. *Dactyloctenium aegyptium* (Crowfoot Grass).
A. Inflorescence; B. Spikelet.

DACTYLOCTENIUM AEGYPTIUM (L.) Richter.

[Fig. 153]

Crowfoot Grass.

Cynosurus aegyptius L.

Eleusine aegyptia Pers.

Dactyloctenium aegyptiacum Willd.

Culms creeping, rooting at the lower nodes; sheaths loose, overlapping, smooth; blades 7-15 cm. long, 2-6 mm. wide, smooth or rough, sometimes pubescent, ciliate on the margin toward the base; spikes 2-6, 1.5-5 cm. long, digitate at the end of the culms or branches; spikelets 3-5 flowered, crowded and overlapping in 2 rows along one side of the rachis which extends beyond the spikelets in a slender naked point; glumes unequal, second one awned; lemmas broad and pointed.

This grass is naturalized from the tropics of the Old World. It is found in yards, waste places and cultivated fields from New York westward to Illinois and California and south to Florida and Mexico. It is not common in Pennsylvania, having been reported only from the southeastern part of the state.

Distribution in Pennsylvania.

Delaware: Flora of Phila. and Vicinity. Philadelphia: Oct., 1864, Canby.

46. ELEUSINE Gaertn.

Goose Grass.

Coarse tufted annual or perennial grasses with stout unilateral spikes, digitate or approximate at the summit of the culm. Spikelets several-flowered, awnless, florets perfect, or uppermost staminate, sessile and closely overlapping in 2 rows along one side of a continuous rachis, which does not extend beyond the terminal spikelet; glumes unequal, shorter than the floret, scabrous on the keel; lemmas with a thickened 5-ribbed keel; palea shorter, acute, the narrowly winged keels distant; grain black, marked with comb-like lines, free, enclosed in lemma and palea.



Fig. 154. *Eleusine indica* (Goose Grass).
A. Inflorescence; B. Spikelet.

ELEUSINE INDICA (L.) Gaertn.

[Fig. 154]

Goose Grass.

Cynosurus indicus L.

An annual; culms flattened, decumbent at the base, 1.5-6 dm. high, smooth; sheaths loose, overlapping, smooth, a few hairs at the top; blades 6-24 cm. long, 2-6 mm. wide, usually smooth; spikes 2-10, 2.5-8 cm. long, whorled or close together at the end of the culm, sometimes 1 or 2 located below the whorl; spikelets overlapping, in 2 rows along the rachis *which does not extend beyond the spikelets in a point*, 3-5 flowered, about 5 mm. long; glumes unequal, second one with a sharp, scabrous keel but no awn; grain black.

This is a weed in yards, along the streets, in filled and waste places. It is found all over North America except the far north. Naturalized from the Old World. It is undesirable in lawns and as it is an annual may be eradicated by keeping it from forming seeds. Apparently it is sometimes mistaken for *Dactyloctenium aegyptium*, although it is easily distinguished by its rachis not extending in a point beyond the spikelets and by the shape of the glumes and florets. The second glume is not awned as is that of *D. aegyptium*.

Distribution in Pennsylvania.

Allegheny: Lawn at R. R. Station, Aspinwall, Sept. 28, 1918, E. M. G. Bucks, Chester, Delaware, Franklin, Huntingdon: Porter's Flora. Lancaster: 1884, 1885, Jas. Galen. Luzerne: 1884. Northampton: Easton, Aug. 7, 1896, A. A. Tyler. Philadelphia: No date. Ex. Herb. Thurber.

47. BOUTELOUA Lag.

Mesquite Grass.

Atheropogon Muhl.

Perennial grasses with narrow flat or convolute leaves, and numerous short, scattered, 1-sided, spreading or reflexed spikes; spikelets with one perfect floret and a sterile, rarely staminate floret (a second or third rudiment sometimes present), sessile and crowded in 2 rows along one side of the continuous flattened rachis; glumes unequal, keeled; lemma broader, 3-5 toothed or cleft, 3 of the teeth usually awn-pointed; palea about as long as the lemma, 2-toothed; sterile florets sometimes reduced to awns, rarely wanting.



Fig. 155. *Bouteloua curtipendula* (Mesquite Grass)
A. Inflorescence; B. Spikelet.

BOUTELOUA CURTIPENDULA (Michx.) Torr.

[Fig. 155]

Mesquite Grass.

Chloris curtipendula Michx.*Bouteloua racemosa* Lag.*Atheropogon curtipendulus* Fourn.

Culms tufted, from short rootstocks, 3-10 dm. high; sheaths loose, pubescent toward the summit; blades 1-3 dm. long, 3-5 mm. wide, flat or involute and setaceous toward the tip, scabrous; spikes numerous, 8-16 mm. long, spreading or usually reflexed, in a long raceme; spikelets 7-10 mm. long; glumes unequal, the first awn-pointed, the second acute; lemmas about 4 mm. long, scabrous, ending in three short awns, sterile lemma with 2 acute lobes and 3 awns. July-September.

This grass is found in dry fields, hillsides, and prairies, Ontario and Manitoba, south to New Jersey, Mississippi, Texas, and California; also in Mexico, Central and South America. It is a good forage plant and the numerous basal leaves afford good pasture in the arid regions of the west.

Distribution in Pennsylvania.

Chester: Near West Chester, Flora of Phila. and Vicinity. Huntingdon: Porter's Flora. Lancaster: Flora of Phila. and Vicinity. Northampton: On the Delaware Hills, Easton, Sept. 1, 1850, Dr. Fraill Greene (Porter's Flora).

48. PHRAGMITES Adans.

Reed.

Tall reed-like perennial grasses with stout culms from ereeping rootstocks, broad flat leaves and large terminal panicles. Spikelets 3-7 flowered; rachilla articulated between the florets, covered with long silky hairs; glumes unequal, lanceolate, acute; lemmas narrow long-acuminate, that of the lowest floret somewhat longer and empty or staminate, the other florets perfect; paleas much shorter than the lemmas; grain free, enclosed in the lemma and palea.

PHRAGMITES COMMUNIS Trin.

[Fig. 156]

Reed Grass.

Arundo phragmites L.*Phragmites phragmites* (L.) Karst.*Phragmites vulgaris* B. S. P.

Culms stout, 1.5-4 m. high from a long creeping rootstock, smooth; sheaths overlapping, loose; ligule a ring of short hairs; blades 1.5-6 dm. long, 1-5 cm. wide, flat, smooth; panicle 1.5-4 dm. long, yellowish brown, branches ascending, densely flowered; spikelets 12-15 mm. long; glumes unequal, first 1-nerved, second 3-nerved; lemmas acuminate, 10-12 mm. long; hairs of the rachilla long, white. August-October.

This grass is found in swampy places and edges of ponds nearly throughout the United States and northward. It is also found in Europe and Asia. It rarely ripens its seeds but is propagated by its rootstocks.

This is our largest native grass and one of the best for binding the banks of rivers. The young shoots are eaten by cattle and the mature stems make a good thatch.



Fig. 156. *Phragmites communis* (Reed Grass).
A. Inflorescence; B. Spikelet.

Distribution in Pennsylvania.

Chester: Porter's Flora. Crawford: Pymatuning Swamp, Harts-town, Aug. 4, 1918; Sept. 13, 1919, E. M. G. Delaware: Porter's Flora. Erie: Presque Isle, Sept. 9-12, 1900, J. A. S.; Aug. 26, 1879, Guttenberg; Aug. 26, 1905, O. E. J. Philadelphia: Along Schuylkill River, Sept. 17, 1898, A. F. K. Krout; Point Breeze, Porter's Flora.

49. CYNOSURUS L.

Dog's-tail Grass.

Annual or perennial tufted grasses with flat leaves and dense erect spike-like inflorescence. Spikelets of two kinds, in small clusters; the lower spikelets of the clusters consisting of narrow glumes and continuous rachilla, the terminal spikelets with broader glumes, articulate rachilla, and perfect florets; glumes of the fertile spikelets 1-nerved; lemmas 1-3-nerved, pointed or short-awned; glumes of the sterile spikelets spreading, 1-nerved; grain finally adherent to the palea.

CYNOSURUS CRISTATUS L.

[Fig. 157]

Dog's-tail Grass.

A slender, erect, monoecious perennial; culms 4-7 dm. high, simple, smooth; sheaths short at the base with rather long slender blades, the upper culm leaf with a long sheath and short blades; panicle spike-like, single at the top of the culm, 5-10 cm. long, 5-10 mm. wide; spikelets arranged in clusters, the terminal ones fertile, the lower ones larger and sterile; glumes of the fertile spikelets narrow, sharp pointed, lemmas broader and sharp-pointed or short awned; lemmas of the sterile spikelets narrow, strongly scabrous on the keel, empty. June-August.

This grass is found in fields and waste places from Newfoundland to Ontario and south to southern New York and New Jersey. It has been introduced from Europe. Rare in Pennsylvania. May be looked for on lawns.



Fig. 157. *Dynosurus cristatus* (Dog's-tail Grass).
A. Inflorescence; B. Cluster of Spikelets.

Distribution in Pennsylvania.

Bucks: Quakertown, July 14, 1921, Frank Ball. Delaware: Wayne, Herb. Phila. Acad. Sc. Montgomery: Collegeville, Herb. Phila. Acad. Sc. Union: Lewisburg, July, 1921, E. M. G.

50. *TRIODIA* R. Br.

Tridens R. & S.
Purple Top.

Perennial grasses with long narrow leaves and open or contracted terminal panicles. Spikelets 3-many-flowered, florets perfect or the uppermost sometimes staminate; glumes unequal, keeled, shorter than the spikelet; lemmas bidentate, 3-nerved, the nerves silky villous below and at least the middle one excurrent between the teeth; palea broad, compressed, 2-keeled.



Fig. 158. *Triodia flava* (Purple Top). A. Inflorescence;
B. Spikelet; C. Floret.

TRIODIA FLAVA (L.) Hitchc.

[Fig. 158]

[Hitchcock, Genera of Grasses of the U. S., U. S. Dept. of Agr. Bull. 772: 73-76. 1920]

Purple Top.

Tridens flavus (L.) Hitchc.*Poa flava* L.*Poa scslerioides* Michx.*Tricuspis scslerioides* Torr.*Sieglingia scslerioides* Scribn.*Triodia scslerioides* Benth.*Triodia cuprea* Jacq.

Culms 1-2 m. high, erect, often viscid above; sheaths bearded at the summit; ligule a ring of short hairs; blades 1-3 dm. long, 6-12 mm. wide, long slender point; panicle 2-4.5 dm. long, loose, open, and nodding, slender branches spreading, naked below; spikelets deep purple or reddish, 7-8 mm. long, 5-8 flowered; glumes mucronate; lemmas 3-nerved, the nerves forming 3 teeth at the apex, nerves silky pubescent below. July-September.

This is a beautiful grass with its large purple or reddish panicles. It is found in fields and along roadsides from Connecticut to Missouri, Kansas and southward. There is no known record of this grass having been found in Pennsylvania west of the Allegheny Mts. It seems to be confined to the eastern part of the State, where it is common along roadsides.

Distribution in Pennsylvania.

Berks: Aug. 30, 1876, T. J. Oberly. Bucks, Chester: Porter's Flora. Dauphin: Harrisburg, Aug., 1920, E. M. G. Delaware, Franklin: Porter's Flora. Huntingdon: Mt. Union, Aug., 1920, E. M. G. Lancaster: 1884, Jas. Galen. Luzerne: Porter's Flora. Northampton: College Hill, Easton, Aug. 22, 1898, Porter. Philadelphia: Wissahickon, Aug. 3, 1919, E. M. G. York: Porter's Flora.

51. TRIPLASIS Beauv.

Sand Grass.

Annuals or perennials with small, nearly simple, contracted or open panicles. Spikelets 3-6-flowered, the rachilla articulated between the remote flowers, which are perfect or the uppermost staminate; glumes unequal, keeled, shorter than the florets; lemmas 2-cleft, with three strongly ciliate nerves, the central one excurrent as a short awn between the teeth or lobes; palea shorter, broad, the nerves densely long ciliate from the middle to the apex; grain free.



Fig. 159. *Triplasis purpurea* (Sand Grass).
A. Inflorescence; B. Spikelet.

TRIPLASIS PURPUREA (Walt.) Chapm.

[Fig. 159]

Sand Grass.

Aira purpurea Walt.

Triplasis purpurea Chapm.

Sieglingia purpurea Kuntze.

A tufted annual; culms 3-8 dm. high, spreading, wiry, pubescent nodes; sheaths loose or inflated, rough; blades short, rigid, scabrous, usually involute; terminal panicles 3-7 cm. long, branches stiff, finally divergent, smaller panicles produced at the nodes later in the season; spikelets 2-5 flowered, 5-8 mm. long, usually purplish; glumes unequal, keeled, shorter than the florets; lemmas 3-nerved, nerves strongly ciliate, 2-lobed at apex with a short awn between the lobes. August-September.

This grass is found in sandy soil along the coast from Maine to Texas; also around the Great Lakes and from Illinois, and Nebraska to Texas. The plant is acid to the taste.

Distribution in Pennsylvania.

Delaware: Flora of Phila. and Vicinity. Erie: Manchester, Aug. 24, 1879, Guttenberg; Presque Isle, Sept. 9-11, 1900, J. A. S. Philadelphia: Navy Yards, 1865, Martindale.

52. ERAGROSTIS Host.

Love Grass.

Long, Bayard, Rhodora 21: 133-140. Aug. 1919.

Annuals or perennial grasses (some dioecious) with contracted or open panicles. Spikelets 3-many-flowered, strongly compressed, the uppermost floret sterile; glumes keeled, much shorter than the spikelets; lemmas membranous, keeled, 3-nerved; paleas shorter than the lemmas, nerves ciliate, often persistent after the fall of the lemmas; grain free, loosely enclosed in lemma and palea.

Plants perennial; panicle diffuse, usually purple1. *E. pectinacea*.
Plants annual; panicle open or contracted but not diffuse (except in *E. capillaris*).

Culms creeping; plants dioecious or polygamous.2. *E. hypnoides*.

Culms erect or spreading, not creeping, flowers perfect.

Spikelets 2-5-flowered.

Plants erect, branched from the base; panicle diffuse, open, pale or green, pedicels mostly over 5 mm. long.3. *E. capillaris*.

Plants decumbent or spreading, branched above the base; panicle oblong, the branchlets rather crowded, usually purple; pedicels usually less than 5 mm. long.4. *E. frankii*.

Spikelets 5-many-flowered.

Lemmas glandular on the keel; spikelets about 3 mm. wide; panicle somewhat contracted.5. *E. ciliensis*.

Lemmas not glandular on the keel; spikelets less than 3 mm. wide.

Spikelets less than 2 mm. wide (very rarely 2 mm. wide).

Hairs at top of sheath absent; panicle dense; pedicels short.

7. *E. peregrina*.

Hairs at top of sheath present; panicle open; pedicels long.

Spikelets linear, about 1 mm. wide; lower glume about 5 mm. long, keels of glumes smooth6. *E. pilosa*.

Spikelets ovate-lanceolate, about 1.5 mm. wide; lower glume about 1 mm. long, keels of glumes scabrous8. *E. caroliniana*.

Spikelets about 2 mm. wide, plants glandular on the margins of the blades and sometimes on other portions9. *E. minor*.

1. ERAGROSTIS PECTINACEA (Michx.) Nees.

[Fig. 160]

Purple Love Grass.

Poa pectinacea Michx.

Eragrostis pectinacea var. *spectabilis* Gray.

A perennial from a short, stout rootstock; culms erect or ascending, 3-8 dm. high, smooth; sheaths smooth, or pilose especially at the summit; ligule a ring of

rather long hairs; blades 1-3 dm. long, 4-8 mm. wide, often villous on the upper surface near the base; panicles 1.5-6 dm. long, pinkish, or purplish, usually included in the sheath at the base, branches very pilose in the axils, spreading; spikelets 5-15 flowered, 3-8 mm. long, pedicels stiff; glumes nearly equal, pointed; lemmas prominently nerved, with a toothed or scabrous margin. August-September.



Fig. 160. *Eragrostis pectinacea* (Purple Love Grass).

This is a beautiful grass, with its large pink panicles, which break off at maturity and roll as tumble weeds banking up against fences and hedges. It is found on dry, sandy soil from Maine to S. Dakota and southward.

Distribution in Pennsylvania.

Allegheny: Highwood Cemetery, Sept. 12, 1899, John Ferguson. Bucks, Chester: Porter's Flora. Delaware: Near Chester, July 22, 1920, E. M. G. Lancaster: 1884, Jas. Galen. Monroe: East Stroudsburg, Aug. 6, 1920, E. M. G., O. E. J. Northampton: College Hill, Easton, Aug. 17, 1899, Porter. Philadelphia: Porter's Flora.



Fig. 161. *Eragrostis hypnoides* (Creeping Eragrostis).
A. Whole plant; B. Spikelet.

2. *ERAGROSTIS HYPNOIDES* (Lam.) B. S. P.

[Fig. 161]

Creeping Eragrostis.
Poa hypnoides Lam.
Eragrostis reptans Nees.

A dioecious or polygamous annual; culms much branched, creeping and rooting at the nodes, 2-5 dm. long with ascending flowering branches 5-12 cm. high; sheaths

hairy at the summit; blades 1-4 cm. long, 1-2 mm. wide; panicle narrow, 2-3 cm. long; spikelets 10-35 flowered, 5-15 mm. long, flowers perfect, staminate, or pistillate; glumes unequal, pointed; lemmas pointed, prominently 3-nerved. July-October.

This species is found in wet, sandy soil along ditches, streams and rivers from Vermont to Ontario, westward and southward.

Distribution in Pennsylvania.

Allegheny: Salt Works Station opposite Homestead, Sept., 1887, B. H. P.; Pittsburgh, Sept., 1886. J. A. S. Bucks: Porter's Flora. Cambria: Johnstown, July 22, 1874, B. H. P. Dauphin: Rockville, Aug. 21, 1923, E. M. G. Erie: Presque Isle, Sept. 9-11, 1900, J. A. S. Franklin, Huntingdon: Porter's Flora. Lancaster: Island in Susquehanna river, Aug. 27, 1862, Porter. Northampton, Philadelphia, Tioga: Porter's Flora. Westmoreland: Conemaugh Furnace, July 22, 1874, B. H. P.



Fig. 162. *Eragrostis capillaris*.

3. ERAGROSTIS CAPILLARIS (L.) Nees.

[Fig. 162]

Poa capillaris L.

Poa tenuis Ell.

Culms slender, erect, 1.5-6 dm. high, branching at the base, smooth; sheaths overlapping, smooth or pilose, especially along the margin, upper ones enclosing the base of the panicle; blades 7-25 cm. long, 1-4 mm. wide, smooth, some long hairs on the margin near the base; panicle more than 1/2 the height of the plant, branches capillary and spreading, lower ones usually included in the sheath and ascending; spikelets 2-4 flowered, 2-3 mm. long, on long divergent pedicels; glumes acute, subequal or the lower one a little shorter; lemmas acute, scabrous on the keel. August-September.

This species is found on dry sandy or gravelly soil from New England to Kansas and southward.

Distribution in Pennsylvania.

Allegheny: Sharpsburg, Sept. 2, 1885, J. A. S.; Near Four-mile Run, Sept. 19, 1885, B. H. P.; Dixmont, Sept. 6, 1919, E. M. G. Chester, Delaware, Franklin, Huntingdon: Porter's Flora. Lancaster: 1886, Jas. Galen. Lawrence: Porter's Flora. Northampton: Chestnut Hill, Easton, Aug. 2, 1898, Porter. Philadelphia: Porter's Flora. Monroe: Tannersville, Sept. 11, 1896, A. A. Tyler.

4. ERAGROSTIS FRANKII (Fisch. Mey. & Lall.) Steud.

[Fig. 163]

A tufted, branched annual; culms 1.5-4 dm. high, erect, or decumbent at the base, smooth; sheaths smooth; ligule a ring of hairs; blades 5-12 cm. long, 2-4 mm. wide,

smooth beneath, rough above; panicle less than $1/2$ the length of the whole plant, open; spikelets 3-5 flowered, 2-3 mm. long, pedicles usually less than 5 mm. long; glumes acute, the first a little shorter; lemmas acute, lateral nerves obscure or faint. August-October.



Fig. 163. *Eragrostis frankii*.

This species is very similar to *E. capillaris* from which it is often difficult to distinguish. The sheaths of *E. capillaris* are usually somewhat pilose particularly on the margin while those of *E. frankii* are glabrous. In *E. capillaris* the panicle is more than $1/2$ the length of the entire plant; in *E. frankii* less than one-half. This species is found in moist, sandy soil from Massachusetts to Minnesota and southward.

Distribution in Pennsylvania.

Allegheny: Penn Ave., near East Liberty stock yards, Pittsburgh, Aug. 30, 1890, B. H. P. Chester: Porter's Flora. Dauphin: Forster's Island, Harrisburg, Porter. Delaware: Eddystone, July 21, 1920, E. M. G. Erie: Manchester, Aug. 24, 1879, Guttenberg. Lancaster, Monroe, Northampton: Porter's Flora.



Fig. 164. *Eragrostis cilianensis* (Stink Grass).
A. Inflorescence; B. Spikelet.

5. ERAGROSTIS CILIANENSIS (All.) Link.

[Fig. 164]

Stink Grass.

Eragrostis poaeoides var. *megastachya* Gray.

Eragrostis megastachya (Koel.) Link.

Eragrostis major Host.

[Hubbard, *Rhodora* 18:235. 1916.]

Culms 2-9 dm. high, spreading from a decumbent base, smooth, branching; sheaths smooth, a few long hairs at the summit; blades 5-15 cm. long, 3-6 mm. wide, smooth beneath, scabrous on upper surface; panicles 5-15 cm. long, greenish-lead color, usually densely flowered; spikelets 5-20 mm. long, about 3 mm. wide, 8-35 flowered, florets close, overlapping; glumes nearly equal, pointed, glandular on the keel as are also the lemmas and pedicels. June-September.

This grass is found in waste and cultivated places almost throughout the U. S. It comes to us from Europe where it is a well known weed in gardens and waste places. It may be eradicated by thorough cultivation. The rather disagreeable odor given out by this species is probably due to the glands found on the pedicels and spikelets. These glands too are marks of identification of the species.

Distribution in Pennsylvania.

Allegheny: Salt Works opposite Homestead, Sept., 1887, B. H. P.; Along R. R. by the Station, Aug., 1897, J. A. S.; Sharpsburg, Sept. 6, 1878, J. A. S.; Highwood Cemetery, Pittsburgh, Sept., 1899, John Ferguson; Pittsburgh, Sept. 25, 1885, B. H. P.; Dixmont, Sept., 1919, E. M. G. Berks: Oct. 25, 1875, T. J. Oberly. Bucks, Chester: Porter's Flora. Dauphin: Harrisburg, Aug. 20, 1922, E. M. G. Delaware: Porter's Flora. Erie: Presque Isle, Aug. 17, 1879, Guttenberg. Franklin, Huntingdon, Lancaster: Porter's Flora. Northampton: Easton, Sept. 3, 1898, Porter. Philadelphia: Porter's Flora.



Fig. 165. *Eragrostis pilosa*. A. Inflorescence; B. Spikelet.

6. *ERAGROSTIS PILOSA* (L.) Beauv.

[Fig. 165]

Poa pilosa L.

A tufted annual; culms erect, decumbent and spreading at the base; sheaths with long hairs at the summit, otherwise smooth; ligule a ring of short hairs; blades 3-12 cm. long, 2-3 mm. wide; panicles open, 5-20 cm. long, usually a tuft of hairs in the axil of the lower branches; spikelets 5-18 flowered, 4-10 mm. long, about 1 mm. wide; glumes acute, the first about 1/2 as long as the second; lemmas obtuse, lateral nerves faint. July-September.

This grass is found in waste places and cultivated grounds, particularly along sandy or gravelly roads and railroads from New England to Michigan and Kansas and southward.

Distribution in Pennsylvania.

Allegheny: Sharpsburg, Sept. 9, 1883, J. A. S.; Dixmont, Sept., 1919, E. M. G. Berks: Near Reading, July, 1919, E. M. G. Chester: Porter's Flora. Dauphin: Harrisburg, Aug. 20, 1922, E. M. G. Delaware: Porter's Flora. Erie: Presque Isle, Sept. 9-12, 1900, J. A. S.; Erie, Oct. 20, 1882, Guttenberg. Fayette, Franklin: Porter's Flora. Lackawanna: Scranton, Aug. 26, 1920, E. M. G. Lancaster, Monroe: Porter's Flora. Northampton: Easton, Aug. 29, 1898, Porter. Philadelphia: Porter's Flora. Somerset: Stoystown, Aug. 19, 1876, B. H. P. Tioga: Cedar Run, Sept. 2, 1920, E. M. G., O. E. J.

Fig. 166. *Eragrostis peregrina*.7. *ERAGROSTIS PEREGRINA* Wiegand.

[Fig. 166]

Rhodora 19: 93. 1917.

"Annual; culms several, somewhat geniculate at the base, ascending or erect, glabrous; leaves 2.6 cm. long, rarely longer, 1-2.5 mm. wide, glabrous; ligule of fine hairs, .5 mm. long or less; sheaths otherwise naked at the summit; panicle rather dense, 5-12 cm. long, 2.5-4 cm. broad, oblong; branches mostly solitary, the longer 1-4 (mostly 2-3) cm. long, spreading at an angle of 45 degrees, rather densely spiklet-bearing to near the base; the axil glabrous; spikelets 6-10 flowered, 3-5 mm. long, 1-2 mm. wide, on very short pedicels .5-2.6 mm. long; empty glumes small, lance-ovate, very acute, hyaline, unequal, the upper about one-half the length of the flowering glume; keel not scabrous; flowering glume (lemma) somewhat spreading, ovate, acute, 1.4 mm. long, thin and membranous, greenish below, chestnut-red above, the tip paler; keel scabrous toward the apex; lateral nerves indistinct; caryopsis .5-.6 mm. long, oval-oblong, amber-brown."

Found in sandy, gravelly soil along roads and railroads in Europe and Asia, and in N. H., N. J., and Pa. in the U. S.

Distribution in Pennsylvania.

Lancaster: Vicinity of Lancaster, Sept., 1889, Small. (Rhodora l. c.). Lehigh: Allentown, 1918, H. W. Pretz. Northumberland: Northumberland, Oct. 10, 1921, E. M. G. Philadelphia: Herb. Phila. Acad. Sc.

[NOTE.—According to Long (Rhodora 20: 173-182, 1918) this species is well distributed about Philadelphia over a radius of approximately sixty miles to the north, east, and west.]



Fig. 167. *Eragrostis caroliniana*.

8. ERAGROSTIS CAROLINIANA (Spreng.) Scribn.

[Fig. 167]

Poa caroliniana Spreng.

Eragrostis purshii Schrad.

Eragrostis caroliniana is very closely related to *E. pilosa*. Their general appearance is very similar, and it requires a close examination to distinguish the two species. The most marked differences are those given in the key. In addition to these characters there are some secondary distinctions such as the length of the florets which are usually less than 1.5 mm. long in *E. pilosa* but commonly over 1.5 mm. long in *E. caroliniana*; lemmas with inconspicuous nerves in *E. pilosa* but with conspicuous nerves in *E. caroliniana*; *E. pilosa* seems to have a greater tendency to be purple tinged than *E. caroliniana*.

Found in dry places from Maine to Ontario and North Dakota, southward to Florida and Texas.

Distribution in Pennsylvania.

Bucks, Chester, Dauphin: Porter's Flora. Delaware: Near Chester, July 22, 1920, E. M. G. Erie: Presque Isle, Sept. 9-12, 1900, J. A. S. Lancaster: Aug., 1884, Jas. Galen and Aschman. Northampton: Martin's Creek, Aug. 24, 1899, Porter; College Hill, Easton, June 12, 1899, Porter; Near Easton, Aug. 29, 1898, Porter. Philadelphia: Porter's Flora.

9. ERAGROSTIS MINOR Host.

[Fig. 168]

Low Love Grass.

Eragrostis eragrostis Karst.

This species is similar to *E. cilianensis*. Many small specimens with short, few-flowered spikelets of *E. cilianensis* are often mistaken for *E. minor*. In *E. minor*

the florets are narrower (only about 2 mm. wide), the lemmas are not grandular on the keel. *E. cilianensis* is common, *E. minor* is rather rare.



Fig. 168. *Eragrotis minor* (Low Love Grass).

It too is naturalized from Europe and is found on waste ground locally throughout the U. S. It has not been extensively reported in Pennsylvania but may be looked for locally.

Distribution in Pennsylvania.

Erie: Presque Isle, Aug. 17, 1879, Guttenberg. Lackawanna: Vacant Lot, Scranton, Aug. 26, 1920, E. M. G., O. E. J. Lancaster: 1885, Jas. Galen.

53. MELICA L.

Melic Grass.

Perennial grasses with simple culms, usually soft flat leaves and rather large spikelets in usually narrow panicles. Spikelets 2-several-flowered, often secund. rachilla extended beyond the fertile florets and bearing 2-3 club-shaped or hooded scales, convolute around each other; glumes large, unequal, membranous, or papery, scarious margined, 3-5-nerved, little shorter than the florets; lemmas convex, 7-13-nerved, firm, with scarious margins, sometimes bearing an awn below the apex; paleas broad, 2-keeled; grain free.

Lemmas awned1. *M. purpurascens*.

Lemma awnless.

Glumes subequal, nearly as long as the 2-flowered spikelet.2. *M. mutica*.

Glumes unequal, shorter than the 3-5-flowered spikelet.3. *M. nitans*.



Fig. 169. *Melica purpurascens* (Purple Oat).
A. Inflorescence; B. Spikelet.

1. *MELICA PURPURASCENS* (Torr.) Hitchc.

[Fig. 169]

Purple Oats.

NOTE:—The following citations will give some of the names which have been applied to this plant:—

Avena striata Michx. Fl. Bor. Am. 1:73. 1803.

Trisetum purpurascens Torr. Fl. U. S. 127. 1824.

Melica striata (Michx.) Hitchc. Rhodora 8:211. 1906.

Avena torreyi Nash. Britton and Brown, Illus. Fl., 2n. ed. Vol. 1: 219. 1913.

Bromelica striata (Michx.) Farwell. Rhodora 21:77. 1919.

Melica purpurascens (Torr.) Hitchc. Genera of Grasses of the U. S., U. S. Dept. of Agr. Bull. 772. 1920.

Culms erect, very slender, 6-10 dm. high; sheaths closed to the summit; ligule sheathing the culm; blade 3-15 cm. long, 2-6 mm. wide, smooth beneath, usually scabrous above, slightly involute; panicle 7-15 cm. long, branches ascending or spreading, spikelet bearing at the ends; spikelet 1.5-2 cm. long; glumes unequal, acute, chestnut colored at the base, fading out toward the apex; florets short bearded at the base; awns about 1 cm. long, spreading. June-July.

This plant is not common in the State. There are specimens in the Herbarium of the Philadelphia Academy of Science from Pennsylvania. It is found in rocky woods from eastern Quebec to Pennsylvania, Minnesota, and westward.

Distribution in Pennsylvania.

Elk: Porter's Flora. Philadelphia: Byberry, Herb. Phila. Acad. Sc. Sullivan: Loyalsock, 1864, C. E. Smith.



Fig. 170. *Melica mutica* (Narrow Melic Grass).
A. Inflorescence; B. Spikelet.

2. *MELICA MUTICA* Walt.

[Fig. 170]

Narrow Melic Grass.

Melica mutica var. *glabra* Gray.*Melica diffusa* Pursh.*Melica mutica* var. *diffusa* Gray.

Culms from knotted rootstocks, 6-9 dm. high, erect, wiry; sheaths overlapping, rough; blades short toward the base, upper ones 10-20 cm. long, 2-10 mm. wide, rough; panicles .8-2.5 dm. long, narrow, with slender ascending branches, or re-

duced to a raceme; spikelets 2-flowered, 7-10 mm. long, nodding; glumes nearly equal, almost or entirely equaling the floret, white, papery margins; lemmas scabrous, 6-8 mm. long, empty lemma at top of spikelet, hood-shaped, exceeded by the lower fertile ones. May-June.

This species is usually found in open woods and thickets from Pennsylvania to Florida and westward to Wisconsin, Iowa and Texas.

Distribution in Pennsylvania.

Berks: Near Reading, Porter's Flora. Lancaster: Safe Harbor, Porter's Flora.



Fig. 171. *Melica nitens* (Tall Melic Grass).

3. MELICA NITENS Nutt.

[Fig. 171]

Tall Melic Grass.

Culms from short horizontal rootstocks, 8-12 dm. high, erect, rather stout; sheaths overlapping, glabrous; blades 1-2 dm. long, 4-8 mm. wide, rough; panicles 1.5-2.5 dm. long, open, the slender branches solitary, or in pairs, spreading; spikelets usually 3-flowered, 10-12 mm. long, pendulous on short pedicels; glumes unequal, very broad, the first shorter than the second, both much shorter than the spikelet; lemmas scabrous, 7-9 mm. long, empty lemmas broad at top, exceeded by the fertile ones. May-June.

This species is found in rocky woods and on cliffs from Pennsylvania to Nebraska and southward. It can easily be distinguished from *M. mutica* by the difference in the spikelets.

Distribution in Pennsylvania.

Lancaster: Martic Hills, 1887, Jas. Galen. This was identified as *M. mutica*. Somerset: Porter's Flora.

54. UNIOLA L.

Spike Grass.

Erect perennial grasses with simple culms, flat or involute leaves and terminal panicles. Spikelets 3-many-flowered, very flat; glumes compressed-keeled, acute or acuminate; lower 1-6 lemmas empty, the perfect lemmas many nerved, firm, compressed-keeled; palea rigid, keels broadly winged; stamens 1-3; grain free, loosely enclosed in the lemma and palea.

Panicle spike-like; spikelets few-flowered and only about 1/2 cm. long.

Panicle open, nodding; spikelets many-flowered, 1 cm. or more long. 1. *U. lara*.
2. *U. latifolia*.



Fig. 172. *Uniola laxa* (Slender Spike Grass).
A. Inflorescence; B. Spikelet.

1. **UNIOLA LAXA.** (L.) B. S. P.

[Fig. 172]

Slender Spike Grass.

Holcus laxus L.

Uniola gracilis Michx.

Culms 6-12 dm. high, erect, simple, slender; sheaths shorter than the internodes; ligule short; blades 1-3.5 dm. long, 2-6 mm. wide, flat, scabrous; panicles 1.5-4.5 dm. long, slender, erect, or nodding at the summit; branches erect, 2-5 cm. long; spikelets 3-6-flowered, 5-7 mm. long, short-pedicelled or nearly sessile; glumes much shorter than the lemmas; lemmas 3-4 mm. long, pointed, spreading in fruit; palea arched, about $\frac{2}{3}$ as long as the lemma. July-September.

This grass is found in moist open woods and thickets near the coast from Long Island southward. Rare in Pennsylvania.

Distribution in Pennsylvania.

Bedford: Porter's Flora. Delaware: Tinicum, July 23, 1898, C. F. Saunders. Delaware: Essington, Aug. 3, 1901, Albrecht. Philadelphia: Byberry, Herb. Phila. Acad. Sc.



Fig. 173. *Uniola latifolia* (Broad-leaved Spike Grass);

2. *UNIOLA LATIFOLIA* Michx.

[Fig. 173]

Broad-leaved Spike Grass.

Culms stout, glabrous, 6-15 dm. high, erect, simple; sheaths smooth; ligule lacerate-toothed; blades 10-22 cm. long, .5-2 cm. wide, narrowed to a rounded, often ciliate base, scabrous margins; panicles 1-2.5 dm. long, branches slender, drooping with the weight of the large flat spikelets; spikelets 1.5-3 cm. long, 1.5-2 cm. wide, and 6-12-flowered; glumes about 1/2 as long as the lemmas, the latter 9-12-mm long and ciliate-hispid on the keel; palea arched, about 1/2 as long as the lemma, rigid, keels broadly winged. August-September.

This grass is found in low thickets and moist, shaded banks of streams from Pennsylvania to Florida and west to Illinois, Kansas, and Texas. Not widely distributed in Pennsylvania.

Distribution in Pennsylvania.

Allegheny: Bellevue Cemetery, 1890, Ferguson; Allegheny City, 1888, C. D. Beadle. Lancaster, Philadelphia: Herb. Phila. Acad. Sc.

55. *DISTICHLIS* Raf.

Marsh Spike Grass.

Alkali Grass.

Dioecious perennial grasses from extensively creeping root-stock, rigid culms, rigid convolute leaves and contracted panicles of large smooth spikelets. Spikelets 8-16-flowered, flattened; glumes unequal, firm, keeled, acute; lemmas rigid, many nerved, acute; palea 2-keeled; stamens 3; grain free, enclosed in lemma and palea.



Fig. 174. *Distichlis spicata* (Marsh Spike Grass). A. Portion of rootstock and stem; B. Inflorescence; C. Spikelet.

DISTICHLIS SPICATA (L.) Greene.

[Fig. 174]

Marsh Spike Grass. Alkali Grass.

Uniola spicata L.*Distichlis maritima* Raf.*Uniola stricta* Torr.*Distichlis spicata* var. *stricta* Scribn.

Culms 1.5-6 dm. high, smooth; sheaths overlapping; blades often conspicuously in two vertical rows, ascending, so rigid and involute as to look like alternate branches, 2-15 cm. long; panicles, 2-6 cm. long, dense; spikelets 6-16-flowered, 8-18 mm. long, pale green or whitish, closely imbricated; glumes unequal, keeled, acute; lemmas 3-5 mm. long, acute. June-September.

This grass is found in salt marshes along the Atlantic coast from Nova Scotia to Texas; also in alkaline soils in the interior and along the Pacific coast north to British Columbia. Found also in the West Indies. So far as known it has been reported only from the Navy Yards in Philadelphia. As it is a plant of alkaline habit it cannot be expected from other places in the State. The only specimen seen from the State is in the Herbarium of the Philadelphia Academy of Science.

56. DACTYLIS L.

Orchard Grass.

Tall perennial grasses with flat leaves and glomerate panicles. Spikelets 2-5-flowered, compressed, nearly sessile, in dense one-sided clusters at the end of the naked panicle branches; glumes unequal, hispid-ciliate on the keel, acute or mucronate; lemmas 5-nerved, ciliate-keeled, short awn-pointed; paleas slightly shorter than the lemmas; grain free, enclosed in the lemma and palea.



Fig. 175. *Dactylis glomerata* (Orchard Grass).
A. Inflorescence; B. Spikelet.

DACTYLIS GLOMERATA L.

[Fig. 175]

Orchard Grass.

Culms coarse, tufted, erect, simple, glaucous, 9-12 dm. high; sheath shorter than the internode, smooth or rough, ligule 2-4 mm. long; blade long, scabrous, 2-6 mm. wide; panicle 1-2 dm. long, the lower branches long, spreading, with flowers clustered at the end; spikelets crowded in dense one-sided clusters at the ends of the branches, 3-5 flowered; glumes unequal, (often about equal), hispid-ciliate on keel; lemma 4-6 mm. long, pointed or short-awned, ciliate on the keel. June-July.

This grass is found in fields and waste places from New Brunswick to British Columbia and south to Florida and California. It is naturalized from Europe and is cultivated as a forage plant for which purpose it serves excellently. It is not a good lawn grass on account of its growing in bunches or tussocks which make an uneven surface. Very common.

Distribution in Pennsylvania.

Allegheny: June 25, 1917, E. M. G.; Pittsburgh, June 6, 1884, J. A. S.; Pittsburgh, June 25, 1889, C. C. Mellor. Chester: Porter's Flora. Erie: Presque Isle, Sept. 9-11, 1900, J. A. S. Franklin: Porter's Flora. Greene: Waynesburg, May 30, 1904, O. E. J. Lancaster, Northampton, Philadelphia: Porter's Flora.

57. BRIZA L.

Quaking Grass.

Annual or perennial grasses with flat or convolute leaves and open showy terminal panicles. Spikelets many-flowered, often heart-shaped, nearly as broad as long, florets almost horizontal, the uppermost usually imperfect; glumes unequal, membranaceous, with broad scarious margins; lemmas, 5-many-nerved, broader than the glumes; palea smaller than the lemma, hyaline, 2-keeled; stamens 3; grain free, enclosed in the lemma and palea.

Perennial; spikelets 5-9-flowered, 6 mm. long, brown and shining. 1. *B. media*. Annual; spikelets 3-6-flowered, 3 mm. long, pale or plum color. 2. *B. minor*.

[Note.—*B. media* not reported from Pennsylvania.]

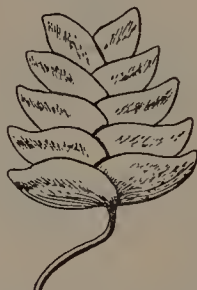


Fig. 176. *Briza minor* (Smaller Quaking Grass).

BRIZA MINOR L.

[Fig. 176]

Smaller Quaking Grass.

An annual; culms 1-4 cm. high, simple, erect, smooth; sheaths shorter than the internodes; ligule 2-6 mm. long; blades 4-12 cm. long, 4-8 mm. wide, sometimes scabrous; panicle erect, branches slender, ascending or spreading; spikelets 3-6-flowered, 2-3 mm. long, slightly broader, pale or plum-color, broadly heart-shaped; glumes about 2 mm. long, scarious-margined; lemmas much broader and strongly saecate below, about 1.5 mm. long.

This grass is found on ballast and in waste places from New Jersey to Virginia. It is also common in California and is widely distributed in tropical America. The only specimen seen or known to have been collected from Pennsylvania is one from Philadelphia (Herb. Phila. Acad. Sc.). It is probably only a transient.

58. PANICULARIA Fabr.

Manna Grass.

Glyceria.

Generally tall, perennial, marsh grasses with flat leaves and terminal panicles. Spikelets few-many-flowered, terete or slightly flattened; glumes unequal, shorter than the florets; lemmas convex, firm, with a scarious margin or apex, and 5-9 strong parallel nerves; paleas about the same length as the lemmas, with the 2 keels near the margin; grain free or slightly adherent to the palea.

Spikelets usually not over 7 mm. long, ovate, oblong.

Panicle contracted, linear or oblong.

Panicle linear, 1.5-3 dm. long1. *P. melicaria*.

Panicle oblong, less than 1.5 dm. long2. *P. obtusa*.

Panicle open, lax.

Spikelets 3-4 mm. wide; lemma obscurely nerved.

Spikelets ovate, 5-10-flowered; lemmas a little over 3 mm. long.
3. *P. canadensis*.

Spikelets oblong, 3-5 flowered; lemmas about 2.5 mm. long. ..4. *P. laxa*.

Spikelets not over 2.5 mm. wide, lemma strongly nerved.

Lemmas about 2 mm. long, obtuse or rounded at apex.

Spikelets 3 mm. long or less; second glume about 1 mm. long; branches
of the panicle often drooping5. *P. nerrata*.

Spikelets 4-6 mm. long; second glume 2 mm. or more long; branches
of the panicle ascending or spreading6. *P. grandis*.

Lemmas 2.5-3 mm. long, truncate and denticulate at the apex. 7. *P. pallida*.

Spikelets 1-4 cm. long, terete.

Lemmas obtuse; palea about as long.

Lemmas 6 mm. long8. *P. fluitans*¹.

Lemmas 3-4.5 mm. long.

Spikelets 1.5-2 cm. long; lemmas 4-4.5 mm. long, a subsessile spikelet in
the axil of each branch.9. *P. septentrionalis*.

Spikelets 1-1.5 cm. long; lemmas 3.5-4 mm. long; pedicelled spikelet
in the axil of each branch.10. *P. borealis*.

Lemmas acute, much exceeded by the palea.11. *P. acutiflora*.



Fig. 177. *Panicularia melicaria* (Long Manna Grass). A. Inflorescence; B. Spikelet.

1. PANICULARIA MELICARIA (Michx.) Hitchc. 1908.

[Fig. 177]

Long Manna Grass

Hubbard, *Rhodora* 14: 186-187. Sept. 1912.

Glyceria clongata (Torr.) Kuntze.

Panicularia torreyana (Spreng.) Merrill.

Glyceria torreyana (Spreng.) Hitchc.

Panicularia clongata (Torr.) Kuntze. [Porter's Flora and
the Flora of Philadelphia and Vicinity.]

Culms solitary or few, erect from a rootstock, 6-9 dm. high; ligule short; sheaths usually shorter than the internodes, closed almost to the summit, smooth; blades lax, 1.5-3 dm. long, 3-6 mm. wide, smooth beneath, slightly rough above; panicle 1.5-3 dm. long, slender, contracted, nodding at the summit, branches erect, standing close to the axis; spikelets 3-4-flowered, 3-4 mm. long; glumes unequal; lemmas about 2 mm. long, distinctly 7-nerved. July-September.

¹Probably not in Pennsylvania.

This species is found in wet woods from Maine and Quebec to Minnesota and south to North Carolina and Kentucky.

Distribution in Pennsylvania.

Blair: Tower Station, June 28, 1881, B. H. P. Bucks, Cameron, Carbon: Porter's Flora. Centre: Bear Meadows, Aug. 11, 1921, E. M. G. Crawford: Pymatuning Swamp; Hartstown, July 3, 1885, B. H. P. Delaware: Flora of Phila. and Vicinity. Franklin, Jefferson, Lackawanna: Porter's Flora. Lancaster: 1887, Jas. Galen. Lehigh: Herb. Phila. Acad. Sc. McKean: Kane, Aug. 22, 1919, E. M. G. Monroe: Pocono Plateau, Dr. Fraill Greene; Bartonsville, 1896, N. L. Britton. Northampton: Herb. Phila. Acad. Sc. Perry: Shermantdale, July 22, 1921, E. M. G. Pike: Porter's Flora. Somerset: Several places, B. H. P. Susquehanna, Tioga, Wayne: Porter's Flora.



Fig. 178. *Panicularia obtusa* (Blunt Manna Grass).
A. Inflorescence; B. Spikelet.

2. PANICULARIA OBTUSA (Muhl.) Kuntze.

[Fig. 178]

Blunt Manna Grass.

Poa obtusa Muhl.

Glyceria obtusa Kuntze.

Culms erect, simple, smooth, 3-12 dm. high; lower sheaths overlapping, smooth, the lower ones usually rough; ligule very short; blades 2-5 dm. long, 4-8 mm. wide, stiff, erect, rough on upper surface, smooth beneath; panicle exserted, oblong, dense, 6-20 cm. long; spikelets 3-7-flowered, 5-6 mm. long, nearly as wide; glumes acute, 1-nerved; lemma 3-3.5 mm. long, obscurely 7-nerved. July-August.

This species is found in swamps and bogs from Nova Scotia and New Brunswick to New York and central Pennsylvania and southward near the coast to North Carolina.

Distribution in Pennsylvania.

Clearfield: Porter's Flora. Monroe: Tobyhanna, Aug. 27, 1919, E. M. G.; Tobyhanna Mills, Porter's Flora.



Fig. 179. *Panicularia canadensis* (Rattlesnake Grass).
A. Inflorescence; B. Spikelet.

3. PANICULARIA CANADENSIS (Michx.) Kuntze.

[Fig. 179]

Rattlesnake Grass.

Briza canadensis Michx.

Glyceria canadensis (Michx.) Trin.

Culms 6-10 dm. high, erect from a rootstock; lower sheaths overlapping, upper ones shorter than the internode, rough; ligule about 2 mm. long, membranous; blades 1.5-3.5 dm. long, 4-8 mm. wide, rough; panicle 1.5-3 dm. long, nearly as wide, loose, branches spreading, usually drooping; spikelets 5-12-flowered, 5-8 mm. long, flattened; glumes unequal, 1-nerved; lemmas 3-4 mm. long, faintly nerved. July-August.

This species is found in wet and swampy places from Newfoundland to Minnesota and southward to New Jersey and Kansas.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Center: Bear Meadows, Aug. 8, 1904, B. H. P.; Aug. 11, 1921, E. M. G. Chester: Porter's Flora. Crawford: Conneaut Lake, July 17, 1874. Erie, Jefferson, Lackawanna, Lancaster: Porter's Flora. Monroe: Mount Pocono, Aug. 26, 1919, E. M. G. Pike, Schuylkill: Porter's Flora. Somerset: Trostles Bridge, Stoystown, July 2, 1877; July 5, 1887, B. H. P.



Fig. 180. *Panicularia laxa*.

4. PANICULARIA LAXA Scribn.

[Fig. 180]

Glyceria laxa Scribn.

This species is very similar to *P. canadensis*. In *P. laxa* the spikelets are usually not over 5-flowered, with lemmas 2.5 mm. long; in *P. canadensis* the spikelets are usually more than 5-flowered, with lemmas a little over 3 mm. long. It is found in wet or swampy places and is not so common as *P. canadensis*.

Distribution in Pennsylvania.

Lackawanna: Moosic Lake, Aug. 26, 1920, E. M. G., O. E. J. Lancaster, Lehigh: Herb. Phila. Acad. Sc. Monroe: Tobyhanna, Aug. 17, 1920, E. M. G., O. E. J.; Pocono Plateau. J. W. Harshberger. Schuylkill: Broad Mountain, Porter's Flora.



Fig. 181. *Panicularia nervata* (Fowl Meadow Grass).
A. Inflorescence; B. Spikelet.

5. **PANICULARIA NERVATA** (Willd.) Kuntze.

[Fig. 181]

Fowl Meadow Grass. Nerved Manna Grass.

Poa nervata Willd.

Glyceria nervata (Willd.) Trin.

Culms 3-10 dm. high, slender, often in large bunches; sheaths scabrous, lower ones overlapping, upper ones shorter than the internodes, closed almost to the summit; ligule about 1 mm. long; blades 1.5-3 dm. long, 4-10 mm. wide, smooth beneath, rough above; panicle 1-2 dm. long, loose, nodding; spikelets 3-7 flowered, 3-4 mm. long, 2-2.5 mm. wide, often with a purple tinge; glumes unequal, second only about 1 mm. long; lemmas 1.5-2 mm. long, distinctly 7-nerved. June-September.

This grass is so common in Pennsylvania that the distribution by counties is omitted. It is found in wet places from Newfoundland to British Columbia and southward to Florida and Texas. "It is of some value as a fodder plant for moist meadows, and, together with *P. americana* (*grandis*) and *Zizania aquatica*, furnishes food for water fowl during the migrations, and for this reason it is of value in game preserves." Scribner, Amer. Grasses I, (U. S. Dept. Agr. Div. Agros. Bull. 7: 287. 1900). It is said to contain a small quantity of hydrocyanic acid, enough to be poisonous if eaten in large quantities. Mosher, Grasses of Illinois, 396, 1918.

6. **PANICULARIA GRANDIS** (Wats.) Nash.

[Fig. 182]

Tall Manna Grass.

Glyceria grandis Wats.

Panicularia americana MacM.

Culms stout, clustered, erect 1-1.5 m. high; sheaths loose, smooth, sometimes rough, closed nearly to the top, lower ones overlapping; ligule about 2 mm. long;

blades 1.5-3 dm. long, 6-15 mm. wide, smooth beneath, rough above; panicle 2-4 dm. long, broad and open, nodding at the summit; spikelets numerous, 4-7-flowered, 3-6 mm. long, usually purplish; glumes unequal, whitish, second one 2-2.5 mm. long; lemma about 2 mm. long, strongly 7-nerved, nearly equaled by the palea. June-August.



Fig. 182. *Panicularia grandis* (Tall Meadow Grass).

This species is found along banks of streams and wet meadows from Nova Scotia to Alaska, south to Pennsylvania and westward to the Pacific coast. It forms a good pasture grass for wet places.

Distribution in Pennsylvania.

Bucks, Clarion, Erie, Huntingdon: Porter's Flora. Lancaster: 1887, Jas. Galen. Lawrence: New Wilmington, June 18, 1887, B. H. P. Monroe, Northampton, Schuylkill: Porter's Flora. Susquehanna: Montrose, July 14, 1922. E. M. G. Tioga: Wellsboro, Sept. 2, 1920, E. M. G., O. E. J.



Fig. 183. *Panicularia pallida* (Pale Manna Grass).
A. Inflorescence; B. Spikelet.

7. PANICULARIA PALLIDA (Torr.) Kuntze.

[Fig. 183]

Pale Manna Grass.
Windsoria pallida Torr.
Glyceria pallida (Torr.) Trin.

Culms slender, 3-10 dm. high, base bent, rooting at the nodes; sheath loose, shorter than the internodes, smooth; ligule 2-4 mm. long; blades 5-15 cm. long, 2-8 mm. wide, rough, acute; panicle 7-15 cm. long, loose, branches ascending, naked at the base; spikelets pale, 4-9-flowered, 6-8 mm. long; glumes oblong, lower one 1.5-2 mm. long; lemmas 2.5-3 mm long, dentate or erose apex. June-August.

This species is found in wet places and shallow water from Nova Scotia and New Brunswick and south to North Carolina and Tennessee. It is similar to *P. nervata* from which it may be distinguished by its longer lower glume and longer lemma.

Distribution in Pennsylvania.

Bucks: Porter's Flora. Delaware: Flora of Phila. and Vicinity. Monroe: Tobyhanna Mills, Porter's Flora. Northampton: Porter's Flora; Flora of Phila. and Vicinity. Philadelphia: Porter's Flora. Somerset: Shanksville, Aug. 6, 1874, B. H. P. Susquehanna, Wayne: Porter's Flora.



Fig. 184. *Panicularia septentrionalis* (Floating Manna Grass).

9. PANICULARIA SEPTENTRIONALIS (Hitchc.) Bicknell.

[Fig. 184]

Floating Manna Grass

Glyceria septentrionalis Hitchc.

Panicularia fluitans (L.) Kuntze. (Porter's Flora).

Culms erect, 1-1.5 m. high, thick, soft, and spongy; lower sheaths overlapping, loose, smooth, upper ones closed nearly to the summit; ligule 5-6 mm. long; blades 1.2-2.5 dm. long, 6-8 mm. wide, slightly rough; panicle 2-2.5 dm. long, rather narrow, branches erect, sometimes spreading; spikelets 7-12 flowered, 1.5-2.5 cm. long nearly sessile, a nearly sessile spikelet in the axil of each branch of the panicle; glumes obtuse, scarious and shining; lemmas 4-4.5 mm. long, faintly 7-nerved, rough all over, erose apex; palea slightly longer than the lemma. July-September.

This species is found in swampy places and in shallow water with the lower leaves floating. Its range is from New England to Virginia and westward. It is similar to *P. fluitans* (L.) R. Br. and to *P. borealis* Nash. It is usually more robust than either and has a lemma only 4 or 4.5 mm. long while *P. fluitans* (L.) R. Br. has one 6 mm. long. Its spikelets are sessile or nearly so while the spikelets of *P. borealis* Nash are borne on pedicels about 1/2 their own length.

Most of the specimens in the Herbarium which have been labeled *P. fluitans* on careful examination prove to be *P. septentrionalis* or *P. borealis*.

Distribution in Pennsylvania.

It is difficult to list its distribution since it has been confused with the species mentioned above.

Bucks: Porter's Flora. Butler: Harmony, 1907, B. H. P. Chester: Porter's Flora. Crawford: Pymatuning Swamp, July 3, 1886, B. H. P. Delaware, Franklin, Huntingdon, Lancaster: Porter's Flora. Lehigh: Various places, Harold W. Pretz. Monroe: Porter's Flora. Montgomery: June 10, 1902, S. S. Van Pelt. Northampton, Philadelphia: Porter's Flora. Somerset: Confluence, Sept. 29, 1921, John Bright. Westmoreland: In pond, Ligonier, Aug. 24, 1918, E. M. G.



Fig. 185. *Panicularia borealis* (Northern Manna Grass).

10. PANICULARIA BOREALIS Nash.

[Fig. 185]

Northern Manna Grass.

Glyceria borealis (Nash.) Batch.

Culms erect from a bent base, rooting at the nodes, 5-12 dm. high; sheaths smooth, overlapping; blades 1-5 dm. long, 2-10 mm. wide, usually folded lengthwise (conduplicate); panicle 1.5-5 dm. long, narrow, slender branches erect or spreading at the ends; spikelets 7-13 flowered, 1-1.5 cm. long, *on a slender pedicel about 1/2 their own length*, a pediceled spikelet in the axil of each branch of the panicle; glumes unequal, smooth, and shining; lemmas 3.5-4.5 mm. long, slightly rough, or smooth, nerves rough, erose apex, a little longer than the paleas. June-August.

This species is found in wet places or shallow water from Newfoundland to Iowa and northwestward. It is a northern species and there is some doubt whether it occurs in Pennsylvania although it has been reported by Twining (Flora of Northeastern Pa.) from the Pocono Plateau, a place where many northern plants are found. It may easily be confused with *P. septentrionalis* from which it can most easily be distinguished by its *pedicelled* instead of *sessile* spikelets. No specimens have been seen from Pennsylvania and the only known place from which it has been reported is the one mentioned above.



Fig. 186. *Panicularia acutiflora* (Sharp-sealed Manna Grass).

11. **PANICULARIA ACUTIFLORA** (Torr.) Kuntze.

[Fig. 186]

Sharp-sealed Manna Grass.

Glycera acutiflora Torr.

Culms 3-9 dm. high, erect, from a decumbent base, smooth; sheaths overlapping, smooth; ligule about 4 mm. long; blades 8-15 cm. long, 4-6 mm. wide, smooth beneath, rough on upper surface; panicle 1.5-3.5 dm. long, branches erect or ascending; spikelets 5-12-flowered, linear, 2-4 cm. long; glumes acute, smooth; lemmas 6-8 mm. long, exceeded by the long, two-pointed paleas.

This species is found in wet places and in shallow water from Maine to Delaware and Ohio. It is rare in Pennsylvania, having been reported from only a few stations. No specimens from the State have been seen.

Distribution in Pennsylvania.

Bucks: Tullytown, Porter's Flora. Huntingdon: Porter's Flora. Philadelphia: Byberry, Flora of Philadelphia and Vicinity.

59. **POA** L.

Blue Grass. Meadow Grass. Spear Grass.

Annual or perennial grasses with flat or convolute leaves ending in boat-shaped point, and contracted or open terminal panicles. Spikelets 2-6-flowered, the uppermost imperfect or rudimentary; glumes 1-3-nerved, keeled; lemmas keeled, 5-nerved, the intermediate nerves obscure or prominent, the dorsal or marginal nerves sometimes soft hairy, often with a tuft of eobwebby hairs at the base; palea 2-nerved and 2-toothed; grain free or sometimes adherent to the palea.

Annuals—

Intermediate nerves of lemma distinct, not cobwebby at base.....1. *P. annua*.Intermediate nerves of lemma obscure, cobwebby, at base....2. *P. chapmaniana*¹

Perennials—

Creeping rootstock present.

Culms distinctly flattened; plants not tufted; panicle contracted, spikelets not over 6 mm. long3. *P. compressa*.

Culms terete or obscurely flattened; plants tufted; panicle open.

Lower branches of the panicle usually in 2's; basal leaves usually as long as the culm; spikelets 6-8 mm. long.4. *P. cuspidata*.Lower branches of the panicle usually in 5's; basal leaves shorter than the culm; spikelets 4-5 mm. long5. *P. pratensis*.

Creeping rootstock wanting.

Lemma glabrous, except the webbed base.

Lemma 3 mm. long, obtuse6. *P. debilis*.Lemma 3.2-4 mm. long, acute7. *P. saltuensis*.

Lemma pubescent above the cobwebby base, at least on the keel.

Culms not over 3 dm. high, alpine or northern plants8. *P. laxa*.

Culms much taller.

Lemma not cobwebby at base, conspicuously scarious at the rounded apex.9. *P. autumnalis*.

Lemma cobwebby at base.

Marginal nerves of lemma glabrous.

Lemmas prominently nerved; sheaths upwardly scabrous.

10. *P. trivialis*.Lemma obscurely nerved; sheath smooth11. *P. alsodes*.

Marginal nerves of lemma pubescent.

Intermediate nerves of lemma obscure; florets acute.

Panicle erect, .4-1 dm. long (rarely longer), branches ascending.

12. *P. nemoralis*.

Panicle drooping, 1-3 dm. long; branches spreading.

13. *P. palustris*.Intermediate nerve of lemma prominent; florets obtuse or acutish14. *P. sylvestris*.Fig. 187. *Poa annua* (Low Spear Grass).

1. POA ANNUA L.

[Fig. 187]

Low Spear Grass.

A small annual; culms 5-25 cm. high, decumbent at the base, smooth, somewhat flattened, tufted; sheaths loose, smooth, usually overlapping; ligule about 2 mm. long; blades 2-10 cm. long, soft, smooth; panicle 3-10 cm. long, open, spikelets crowded, 3-6 flowered, about 4 mm. long; glumes unequal, the first more pointed than the longer and broader second one; lemmas distinctly 5-nerved, the nerves pubescent below, cottony tuft at base absent.

This species is naturalized from Europe and is common in waste places and lawns throughout the warmer parts of the U. S. and the Old World. It is not of much value as a lawn grass as it cannot withstand the droughts of summer. It is so common everywhere in the State that the many counties from which it has been reported are not listed.

¹Not reported from Pennsylvania.



Fig. 188. *Poa compressa* (Canada Bluegrass). A. Spikelet; B. Floret.

3. POA COMPRESSA L.

[Fig. 188]

Canada Bluegrass. Wire grass.

A perennial from an extensively creeping rootstock; culms strongly flattened, 2-6 dm. high, bluish-green, smooth; sheaths loose, flattened, smooth, shorter than the internodes; ligule short; blades 2-10 cm. long, about 2 mm. wide, smooth beneath, rough above; panicles 2-8 cm. long, narrow, branches short and spikelet-bearing nearly to the base; spikelets crowded, 3-9-flowered, 4-6 mm. long; glumes acute, 3-nerved; lemmas obscurely nerved; more or less bronzed at the tip, slightly webbed at the base, midnerve usually silky pubescent to about the middle, the lateral nerves only at the base. May-September.

This grass is found in waste places, in cultivated grounds and in woods throughout N. America. It is naturalized from Europe and has become one of our most common grasses. It is a splendid pasture and forage grass, not yielding, however, so much hay as *P. pratensis* (Kentucky blue grass). On account of its running rootstock it makes a close dense sod and is therefore used in making lawns for which use it is not so popular as *P. pratensis*. *Poa compressa* is often used on clay soils and soils lacking lime on which *Poa pratensis* will not thrive. The species is so common in Pennsylvania that the many counties from which it has been reported are not listed.



Fig. 189. *Poa cuspidata* (Short-leaved Spear Grass).
A. Inflorescence; B. Spikelet; C. Floret.

4. POA CUSPIDATA Nutt.

[Fig. 189]

Short-leaved Spear Grass.

Poa brevifolia Muhl.

Poa brachyphylla Schultes.

Merrill, Rhodora 4: 145. 1902.

A tufted perennial from a creeping rootstock; culms 3-5 dm. high, upper culm leaves short, basal leaves often nearly as long as the culm, abruptly cuspidate-tipped; panicle 7-12 cm. long, branches usually in pairs, spreading, often reflexed, spikelet-bearing at the ends; spikelets 3-5-flowered; glumes unequal, acute; lemmas distinctly nerved, webbed at base, keel and marginal nerves slightly pubescent, others naked. April-June.

This species is found in rocky and hilly woods from New York to Georgia and westward to Illinois. It, like *P. autumnalis*, is one of our very earliest grasses. It is common on wooded hillsides in southwestern Pennsylvania and is found in bloom early in April before many other plants are in flower.

Distribution in Pennsylvania.

Allegheny: Common on wooded hillsides, E. M. G., et al. Bucks, Chester, Delaware: Porter's Flora. Fayette: Indian Creek, May 31, 1920, E. M. G. Franklin, Huntingdon, Lancaster, Northampton, Philadelphia Porter's Flora. Washington: Riverview, 1919, E. M. G.

5. POA PRATENSIS L.

[Fig. 190]

Kentucky Bluegrass.

A perennial from a long running rootstock; culms 3-12 dm. high, erect, smooth; sheaths smooth, the lower overlapping, the upper often shorter than the internodes; ligule about 1.5 mm. long; blades of culm 5-15 cm. long, basal ones longer, 1-6 mm. wide; panicle 6-20 cm. long, slender branches in fascicles of 3-5, ascending,

divided and spikelet-bearing above the middle; spikelets crowded, 3-5 flowered, 4-5 mm. long; glumes unequal, pointed, scabrous on the keel; lemmas 3 mm. long, much webbed at base, marginal nerve and keel pubescent below, others smooth. May-Aug.



Fig. 190. *Poa pratensis* (Kentucky Bluegrass).
A. Inflorescence; B. Spikelet.

This species is found in fields, meadows and woods throughout nearly all of North America. It is an ideal grass for lawns, forming a firm even sod of a dark green color, which under proper conditions is permanent. It thrives best in a moist cool climate and on limestone soil. It is the most important pasture grass in America. On account of its being difficult to establish and of its requiring two or three years to form a good stand it is seldom sown alone. A low yield is the chief objection to its use as a hay crop. As it is so common in the state, the many places from which it has been reported are not listed.

6. POA DEBILIS Torr.

[Fig. 191]

Weak Spear Grass.

A slender, weak perennial; culms 3-10 dm. high, erect, smooth; sheaths smooth, much shorter than the internodes; ligule 1-2 mm. long; blades 2.5-11 cm. long, 2 mm. or less wide, smooth; panicles 4-12 cm. long, nodding, slender branches ascending, few-flowered; spikelets 2-4-flowered, 3-4 mm. long; glumes unequal, acute; lemmas smooth, webbed at the base. May-June.

This species is found in rocky woods from Nova Scotia and New Brunswick, southward to Pennsylvania and westward to Minnesota. It is rare in Pennsylvania, having been reported, so far as is known, only from Monroe County.



Fig. 191. *Poa debilis* (Weak Spear Grass).
A. Inflorescence; B. Spikelet; C. Floret.

Distribution in Pennsylvania.

Monroe: Naomi Pines, Porter's Flora; Tannersville, May 30, 1902, Benj. K. Smith; Pocono Summit, May 31, 1921, E. M. G.



Fig. 192. *Poa saltuensis*. A. Inflorescence; B. Spikelet.

7. *POA SALTUENSIS* Fernald & Wiegand.

[Fig. 192]

Rhodora 20: 122-126. 1918.

Caespitose: culms slender, 2-8.5 dm. tall, leafy at the base; the cauline nodes 2-4, remote; leaves 2-5 mm. wide; the lower elongate; the cauline short, with the blade usually shorter than the sheath, smooth-margined or somewhat scabrous at tip; ligule of the upper leaves short, 0.3-1.5 mm. long, usually erose; primary panicles 0.6-2 dm. long, nodding and secund; the branches long and slender, ascending and widely nodding, more or less scabrous, spikelet-bearing near the tips, the middle and lower in 2's, very rarely in 1's or 3's: spikelets 3-5-flowered, 3.5-5.5 mm. long: glumes sub-equal, acute, about three-fourths as long as the nearest lemma, glabrous: lemmas 3.2-4 mm. long, acute, glabrous except the webbed base, green or rarely purple-tinged; margin narrowly hyaline; the marginal and intermediate nerves prominent."

Found in, "Woodland thickets and recent clearings, extending from eastern Quebec to western Ontario, southward to Nova Scotia, southern Maine, southern New Hampshire, central Massachusetts, Connecticut, New York, the mountains of Pennsylvania, and westward to northern Michigan." Closely related to *Poa debilis* Torr.

Distribution in Pennsylvania.

Monroe: Rocky woods near Tannersville, May 30, 1902, Canby.
Sullivan: Without locality, 1862, C. E. Smith; Loyalsock, May, 1864, C. E. Smith; Union City, July 12, 1890, Fernow.



Fig. 193. *Poa laxa* (Mountain Spear Grass). A. Inflorescence; B. Spikelet; C. Floret.

8. *POA LAXA* Haenke.

[Fig. 193]

Mountain Spear Grass.

A tufted perennial; culms 2-4 dm. high, slender, smooth; sheaths often overlapping; ligule about 2 mm. long; blades 2.5-7 cm. long, about 2 mm. wide; panicle 2.5-7 cm. long, often one-sided and nodding, loosely flowered, slender branches erect or ascending, spikelet-bearing at the ends; spikelets 2-5 flowered, 4-5 mm. long; glumes acute, rough on the keel at the apex; lemmas 3-3.5 mm. long, keel pilose on the lower half, rough above, lateral nerves pilose toward the base, Summer.

This species is a northern plant extending from Alaska to Greenland and southward to the high mountains of New England and New York. It is found also in Europe and Asia. So far as is

known it has never before been reported from Pennsylvania. The specimen reported is in the Herbarium of the Carnegie Museum. It was collected on Presque Isle, Sept. 9-11, by J. A. Shafer and labeled *Poa compressa*. It certainly is not *P. compressa* and, although the specimen is a little over-ripe, the writer has, with a little doubt but rather positively, identified it as *Poa laxa*. Considering the fact that northern plants are found on Presque Isle, the seed probably having been carried by migrating birds or otherwise, it is not at all impossible to find this species in that locality.



Fig. 194. *Poa autumnalis* (Flexuous Spear Grass).

9. POA AUTUMNALIS Muhl.

[Fig. 194]

Flexuous Spear Grass.

Poa flexuosa Muhl.

A slender perennial; culm 3-9 dm. high, smooth; sheaths usually shorter than the internodes; ligule about 1 mm. long; blades 5-12 cm. long, 2-3 mm. wide, smooth beneath, rough on upper surface; panicle 8-20 cm. long, branches long and spreading, spikelet-bearing at the ends; spikelets 4-6 flowered, 6 mm. long; glumes unequal, acute; lemmas pubescent at the base between the nerves, not webbed, keel pubescent about $\frac{3}{4}$ of its length. March-May.

This species is found in low woods in the southern states as far north as Pennsylvania. It is not common in the state, at least in the western part.

Distribution in Pennsylvania.

Bucks, Lackawanna: Porter's Flora. Lancaster: Bart and Martie Twp., Porter's Flora; Small and Carter (Flora of Lancaster County) report it as rare. Monroe: Indian Rock, Porter's Flora, Sullivan: Porter's Flora.

10. POA TRIVIALIS L.

[Fig. 195]

Rough-stalked Meadow Grass.

A perennial without rootstock; culms 3-9 dm. high, somewhat decumbent at the base, rough below the panicle; sheaths slightly retrorsely scabrous; ligule 4-6

mm. long; blades 5-20 cm. long, 2-4 mm. wide, generally rough; panicle 6-15 cm. long, branches spreading or ascending, and spikelet bearing from about the middle; spikelets 2-3 flowered, about 3 mm. long; glumes unequal, acute, keel rough; lemmas webbed at base, distinctly 5-nerved, midnerve silky pubescent below, others smooth. May-August.



Fig. 195. *Poa trivialis* (Rough-stalked Meadow Grass).

This grass is found in moist meadows and waste places from Newfoundland to Ontario and south to South Carolina and Louisiana. Rather common.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 8, 15, 1918, E. M. G.; Pittsburgh, June, 1882, B. H. P. Bucks: Porter's Flora. Butler: Near Renfrew, June 19, 1920, E. M. G. Centre, Chester, Clinton: Porter's Flora. Dauphin: Wildwood Park, June 5, 1921; Inglenook, June 18, 1923, E. M. G. Delaware: Porter's Flora. Lancaster: Rawlinsville, June 6, 1922; Pequea, June 7, 1922, E. M. G. Northampton, Philadelphia, Pike, Somerset: Porter's Flora. Westmoreland: Hillside, June 7, 1919; Kingston, June 8, 1919, E. M. G.



Fig. 196. *Poa alsodes* (Grove Meadow Grass).
A. Spikelet; B. Floret.

11. POA ALSODES Gray.

[Fig. 196]

Grove Meadow Grass.

An erect, slender perennial; culms 2-6 dm. high, smooth; the uppermost sheath often enclosing the base of the panicle; ligule about 1 mm. long; blades 5-20 cm. long,

2-5 mm. wide, usually rough; panicle 1-2 dm. long, slender branches in whorls of 3-4, ascending, or finally spreading; spikelets 2-3-flowered, about 5 mm long; glumes unequal, acute; lemmas about 4 mm. long, faintly nerved, webbed at the base, keel pubescent from near the middle to the base. May-June.

This species is found on wooded hillsides and thickets from eastern Quebec to Minnesota and southward.

Distribution in Pennsylvania.

Cambria: Johnstown, June 1, 1874, B. H. P. Erie: Porter's Flora. Fayette: Ohiopyle, May 14, 1905, O. E. J.; Indian Creek, May 31, 1920, E. M. G. Somerset, Sullivan: Porter's Flora. Venango: Oil City, May 28, 1879, B. H. P. York: Frogtown, May 29, 1921, E. M. G.



Fig. 197. *Poa nemoralis* (Wood Meadow Grass).
A. Spikelet; B. Floret.

12. POA NEMORALIS L.

[Fig. 197]

Wood Meadow Grass.

An erect slender perennial; culms 3-7 dm. high, slender, somewhat bent at the base; leaves lax, 3-8 cm. long, 2 mm. wide, smooth; panicle 4-10 cm. long, slender branches ascending; spikelets 2-5-flowered, 3-5 mm. long; glumes acuminate; lemmas 2-3 mm. long, *intermediate nerves obscure*, sparingly webbed at the base. June-September.

This grass is found in meadows and open woods from Newfoundland to Pennsylvania, west to Colorado, Idaho, and British Columbia. It has been introduced from Europe and is cultivated in some places. The only known place in the state from which it has been reported is Easton, Northampton County. There are two specimens in the Herbarium of the Carnegie Museum; the one collected at Easton, June 15, 1896, by A. A. Tyler, the other one in the woods on College Hill, Easton, July 12, 1899 by Porter. The label of Porter's specimen bears the note "Probably introduced from Europe."

13. POA PALUSTRIS L.

[Fig. 198]

Fowl Meadow Grass.

Poa serotina Ehrh.

Poa triflora Gilib.

[For complete synonymy see Hubbard, Rhodora 18: 235. 1916.]

A perennial; culms 3-15 dm. high; sheaths usually shorter than the internodes, smooth; ligule 3-5 mm. long; blades 8-15 cm. long, 2-4 mm. wide, smooth or rough;

panicles 1-3 dm. long, often purplish, slender branches spreading, spikelet-bearing above the middle; spikelets 2-4-flowered, about 4 mm. long; glumes unequal, rough on the keel toward the apex; intermediate nerves of the lemmas obscure, much webbed at the base, midnerve and marginal nerve pubescent on the lower half. July-August.



Fig. 198. *Poa palustris* (Fowl Meadow Grass). A. Spikelet; B. Floret.

This species is found in wet meadows and swampy places, in the southern states, north to Pennsylvania. It is good forage grass for wet places.

Distribution in Pennsylvania.

Allegheny: Edgewood, June, 1918, E. M. G.; Glenshaw, July 18, 1918, E. M. G. Crawford: Conneaut Lake, July 11, 1923, E. M. G. Erie: Porter's Flora. Monroe: Tobyhanna, Aug. 13, 1920, E. M. G., O. E. J., G. K. J. Montgomery, Pike: Porter's Flora.



Fig. 199. *Poa sylvestris* (Sylvan Spear Grass).

14. POA SYLVESTRIS Gray.

[Fig. 199]

Sylvan Spear Grass.

A perennial without rootstock; culms 3-12 dm. high, slightly flattened, smooth; sheaths shorter than the internodes; ligule 1 mm. long or less; blades of the culms 3-15 cm. long, basal ones longer, 2-6 mm. wide, smooth beneath, rough above; panicle 1-2 dm. long, branches slender, flexuous, spreading or reflexed, spikelet-bearing at the end; spikelet 2-4-flowered, 2.5-4 mm. long; glumes unequal, pointed; lemmas about 2.5 mm. long, webbed at the base, intermediate nerve prominent, midnerve pubescent to the top. April-July.

This species is found in rich, rocky woods from New York to Wisconsin, Nebraska and southward.

Distribution in Pennsylvania.

Allegheny: Guyasuta, June 1, 1918, E. M. G.; Montour Run, May 29, 1886, B. H. P. Bucks: Porter's Flora. Butler: Near Renfrew, June 19, 1920, E. M. G. Chester: Valley Forge, Porter's Flora. Delaware: Flora of Phila. and Vicinity. Erie: Porter's Flora. Lancaster: 1884, Jas. Galen. Northampton, Philadelphia, Wayne: Porter's Flora.

60. PUCCINELLIA Parl.

Goose Grass. Sea Spear Grass.

Tufted perennial grasses with flat or involute leaves and contracted or open panicles. Spikelets 3-several-flowered; glumes unequal, obtuse or acute; lemmas rounded on the back, 5-nerved, the nerves very obscure or almost wanting; palea about as long as the lemma; grain usually adhering to the palea.

Plants stoloniferous; lemmas 3-4 mm. long1. *P. maritima*.

Plants not stoloniferous; lemmas less than 3 mm. long.

Lemma 1.5-2 mm. long; panicle widely spreading2. *P. distans*.

Lemmas 2-2.5 mm. long; panicle contracted3. *P. fasciculata*.



Fig. 200. *Puccinellia maritima* (Sea Spear Grass).
A. Inflorescence; B. Spikelet.

1. PUCCINELLIA MARITIMA (Huds.) Parl.

[Fig. 200]

Goose Grass.

Sea Spear Grass.

Poa maritima Huds.

Glyceria maritima M. & K.

A stoloniferous plant; culms 3-5 dm. high, decumbent at the base, or erect, simple, smooth; sheaths usually exceeding the internodes; ligule 1-2 mm. long; blades 1-13 cm. long, 2 mm. wide or less, flat or involute; panicles 6-15 cm. long, more or less contracted, sometimes open, ascending branches solitary or in pairs; spikelets 3-10 flowered, 6-12 mm. long; glumes unequal, first usually 1-nerved, second 3-nerved; lemmas obtuse or truncate, 3-4 mm. long. July-Aug.

This species is found in salt marshes and beaches along the coast from Labrador to Southern New England, and Alaska to British Co-

lumbia; also on ballast and waste places in the seaports farther south.

Distribution in Pennsylvania.

Philadelphia: On ballast, July, 1870, Martindale; Navy Yards, 1865, Chas. E. Smith.

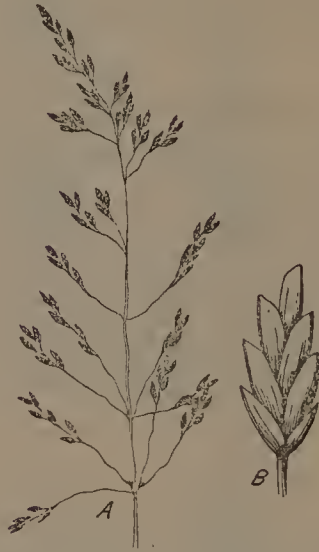


Fig. 201. *Puccinellia distans* (Spreading Spear Grass).
A. Inflorescence; B. Spikelet.

2. PUCCINELLIA DISTANS (L.) Parl.

[Fig. 201]

Spreading Spear Grass.

Poa distans L.

Glyceria distans Wahl.

Tufted; no rootstock; culms 3-6 dm. high, decumbent at the base, glabrous; sheaths smooth; ligule 1-2 mm. long; blades short, 2-4 mm. wide, usually stiff and erect, slightly if at all involute; panicles 5-18 cm. long, loose and widely spreading, branches very slender, spreading or deflexed, in clusters of 2-5, flower-bearing mostly above the middle; spikelets 3-6 flowered, 3-6 mm. long; glumes unequal; lemmas 1.5-2 mm. long, truncate-obtuse and rather distinctly nerved, the nerves finely pubescent below. June-Aug.

This species is found on saline soils along the coast and on ballast from Nova Scotia to New Jersey and Pennsylvania and along the west coast from California to Alaska. Reported only on and around ballast from Philadelphia by Porter. (Porter's Flora).

3. PUCCINELLIA FASCICULATA (Torr.) Bicknell.

[Fig. 202]

Poa fasciculata Torr.

Bicknell, Bull. Torr. Bot. Club 35: 197. 1908.

This is a species which has been included in *P. distans*. Bicknell, l. c. says.—“In *P. fasciculata*, the culms, although often geniculate below, are not decumbent but stiffly ascending or erect, the exerted part longer than in *P. distans* and sensibly stouter and stiffer, the panicles much smaller and narrow, sometimes almost spike-like, formed of appressed or ascending stiff branches mostly single or in pairs and floriferous from near the base, the spikelets crowded, sessile or stipitate, the flowering scales (lemmas) 2-2.5 mm. long, acutish or obtuse, more coriaceous than in *P. distans* and less distinctly nerved, the base of the nerves glabrous or glabrate.”

Fig. 202. *Puccinellia fasciculata*.

This species replaces the northern, larger flowered species, *P. maritima*, from southern New England to New Jersey. In the herbarium of the Philadelphia Academy of Science there are three specimens collected from Philadelphia which were included in *P. distans*. One specimen was collected by Martindale, 1865; another by C. A. Boice, 1878; a third by Chas. E. Smith, 1862.

In the National Herbarium of Washington is a specimen collected on ballast in Philadelphia, 1876, by Martindale; another June 4, 1865 by E. Diffenbaugh (Porter's Herbarium).

61. FESTUCA L.

Fescue Grass.

[Piper, North America species of Festuca. Contributions U. S. Nat. Herb. 10: 1-48. 1906.]

Annual or perennial grasses with terminal panicles. Spikelets 2-many-flowered; rachilla articulate at the joints and above the glumes; florets all perfect or the uppermost staminate; glumes unequal or subequal, the lower 1-nerved, the upper 3-nerved; lemma narrow, lanceolate, 5-nerved, rounded on the back, usually awned; palea usually about equaling the lemma; lodicules 2, about as long as the ovary, usually bifid; stamens 3 in the perennials, often only 1 in the annuals; grain often adhering to the palea.

Plants annual; stamens usually 1, sometimes 3.

Glumes somewhat unequal, the lower 3 mm. long; spikelets 5-13 flowered; lemma without scarious margins; awn usually not longer than the lemma
1. *F. octoflora*.

Glumes very unequal, the lower 1.5-2 mm. long (1/3-1/2 as long as the second); spikelets 1-5-flowered; lemma scarious margined; awn about twice as long as the lemma.2. *F. myuros*.

Plants perennial; stamens 3.

Blades involute; panicle commonly 5-10 cm. long, contracted.

Lemma awned.

Leaf blades capillary, .3-.6 mm. broad.3. *F. ovina*.

Leaf blades .7-1 mm. broad4. *F. ovina duriuseula*.

Lemma awnless5. *F. ovina capillata*.

Blades flat; panicle usually 10-20 cm. long, narrow or with open spreading branches.

Lemmas 5-7 mm. long, awnless or rarely short-awned; spikelets 5-10-flowered6. *F. elatior*.

Lemmas less than 5 mm. long (usually, 4-4.5), awnless; spikelets 3-6-flowered.

Lemma acute; spikelets few, near the ends of the branches.7. *F. obtusa*.

Lemma obtuse; spikelets somewhat aggregated from about the middle of the branches8. *F. shortii*.



Fig. 203. *Festuca octoflora* (Slender Feseue Grass).
A. Inflorescence; B. Spikelet.

1. FESTUCA OCTOFLORA Walt.

[Fig. 203]

Slender Feseue Grass.

Festuca tenella Willd.

An annual; culms slender, erect, simple, smooth, .5-4 dm. high; sheaths smooth or pubescent, shorter than the internodes; blades 2-10 cm. long, linear, involute; panicle 3-12 cm. long, sometimes one-sided, branches erect or ascending, 3-angled; spikelets 5-12 mm. long, 5-13 flowered; glumes subulate-lanceolate, the lower 1-nerved, 3 mm. long, the upper 3-nerved, 4 mm. long; lemma lanceolate, glabrous or scabrous, obscurely 5-nerved, 4-5 mm. long, awn 1-7 mm. long; stamen 1.

This species is very extensive in its range, extending from Ontario to British Columbia and southward throughout the U. S.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 6, 1919, E. M. G. Bucks, Chester: Porter's Flora. Cumberland: Doubling Gap, May 30, 1922, E. M. G. Delaware: Porter's Flora. Erie: Presque Isle, June 9-11, 1905; May 15, 1905, O. E. J. Franklin: Mt. Alto, May 17, 1921, E. M. G. Huntingdon: Porter's Flora. Lancaster: McCall's Ferry, June 7, 1922, E. M. G.; 1885, Jas. Galen. Mercer: Sharon, July, 1886, F. T. Aschman. Northampton: Chestnut Hill, Easton, June 18, 1898, Porter. Philadelphia: Flora of Phila. and vicinity, Keller and Brown. Westmoreland: May 30-31, 1903, J. A. S. and O. P. Medsger.

2. FESTUCA MYUROS L.

[Fig. 204]

Rat's-tail Feseue Grass.

An annual; culms erect, solitary, or in small tufts, 2-6 dm. high, glabrous; sheaths smooth, overlapping; blades smooth, involute, or rarely flat, panicle 7-20 cm. long, narrow, branches appressed, tips usually nodding; spikelets 4-5-flowered, 8-11 mm. long, pedicels 1-2 mm. long; first glume 1-nerved, 1.5-2 mm. long, second 4-5 mm. long; lemma linear-lanceolate, scabrous above, scabrous awn about twice the length of the lemma; stamen 1. June-July.



Fig. 204. *Festuca myuros* (Rat's-tail Fescue Grass).
A. Inflorescence; B. Spikelet.

This species is found in waste places and dry fields from New England to Ohio and southward; also on the Pacific coast. No specimen from Pennsylvania has been seen, and the only known place from which it has been reported is Bucks County in Porter's Flora of Pennsylvania.

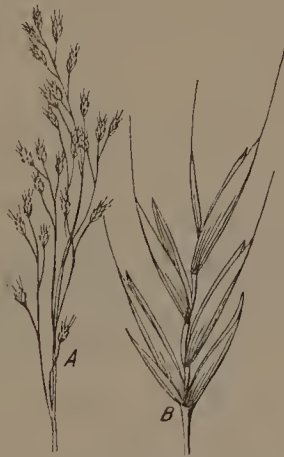


Fig. 205. *Festuca ovina* (Sheep's Fescue).
A. Inflorescence; B. Spikelet.

3. FESTUCA OVINA L.

[Fig. 205]

Sheep's Fescue.

Festuca ovina vulgaris Koch.

A tufted perennial; culms erect, 1.5-6 dm. high, smooth; sheaths smooth, shorter than the internodes; blades strongly involute, firm, cylindric, basal ones 5-12 cm. long; panicle 5-10 cm. long, contracted after blooming, branches ascending; spikelets 3-6 flowered (rarely 9), sometimes with a purple tinge; first glume 1-nerved, about 2 mm. long, second 3-nerved, about 2.5 long; lemma lanceolate, smooth, or scabrous, 3-3.5 mm. long, awn 1 mm. or more long; stamens 3. June-July.

This grass is cultivated as a pasture grass and has in this way, escaped in many places. The native form of this plant which occurs around the Great Lakes and in the White Mountains differs from the typical European form in its more strict, narrow panicle. Its distribution in Pennsylvania seems to be very limited.

For a complete discussion of the species and its many varieties, see Piper, N. A. Species of Festuca, Contributions U. S. National Herbarium 10: 1-48. 1906.

Distribution in Pennsylvania.

Erie: Presque Isle, Aug. 17, 1919, E. M. G. Franklin: Mt. Alto, May 17, 1921, E. M. G. Pike: Porter's Flora. Susquehanna: Montrose, July 14, 1922, E. M. G.

4. FESTUCA OVINA DURIUSCULA (L.) Koch.

Festuca duriuscula L.

This variety which is reported from the following places in the state has harsh leaves about 1 mm. wide. Piper (N. A. Species of Festuca, Contributions U. S. Nat. Herb. 1906) says, "Judging from the herbarium material this subspecies is but sparingly introduced in America. Most specimens so named are *F. ruba*." No specimens have been seen from the state.

Distribution in Pennsylvania.

Bucks: Andalusia, Flora of Phila. and Vicinity. Chester, Northampton: Flora of Phila. and Vicinity. Philadelphia: Flora of Phila. and Vicinity, Gerard Point.

5. FESTUCA OVINA CAPILLATA (Lam.) Hack.

Filiform Fescue Grass

Festuca capillata Lam.

A densely tufted perennial; culms erect, 1.5-4 dm. high, smooth; sheaths longer than the internodes, basal, ligule short; blades filiform, involute, the basal ones about 1/3 as long as the culm, the upper ones shorter; panicle 3-5 cm. long, branches erect, about 1 cm. long; spikelets 4-5 flowered, 4-5 mm. long; glumes unequal, pointed; lemma about 2.5 mm. long, unawned. June-July.

This grass is found in fields and along roadsides from Main to New Jersey and Michigan and northward.

Distribution in Pennsylvania.

Allegheny: On terrace of lawn, along Maple Avenue, Edgewood, June 23, 1918, E. M. G. Delaware: Herb. Phila. Acad. Sc. Porter's Flora gives it as adventive about the large cities.

6. FESTUCA ELATIOR L.

[Fig. 206]

Tall or Meadow Fescue Grass.

Festuca pratensis Huds.

Festuca poaeoides Michx.

A tufted perennial often with a short creeping rootstock; culms 5-12 dm. high, smooth, erect; sheaths shorter than the internodes; ligule nearly obsolete; blades 1-6 dm. long, 4-8 mm. wide, smooth beneath, scabrous on upper surface; panicle

erect, 1-2 dm. long, contracted after blooming, branches spikelet-bearing nearly to the base; spikelets 3-13-flowered (usually 6 or 8-flowered), 9-11 mm. long, pale green to purplish; glumes lanceolate, first 1-3-nerved, about 3 mm. long, the second 3-5-nerved, about 4 mm. long; lemma scabrous at the summit, 5-7 mm. long, acute, rarely short-awned. July-August.



Fig. 206. *Festuca clatior* (Tall or Meadow Fescue).
A. Inflorescence; B. Spikelet.

This is a very common grass in waste places. It is naturalized from Europe and is cultivated for hay. Its distribution is extensive, being found throughout the U. S. and southern Canada. This species is very variable and the same plant assumes different aspects during, and after blooming, the spikelets are open and loose while in bloom but close and contracted after the blooming period is over.

Distribution in Pennsylvania.

Allegheny: Many specimens, common. Blair, Bucks, Chester: Porter's Flora. Crawford: Hartstown, July 30, 1918, E. M. G. Dauphin: Hummelstown, July 10, 1918, E. M. G. Delaware, Erie, Franklin, Huntingdon, Jefferson, Lancaster: Porter's Flora. Lawrence: June 19, 1879, J. A. S. Northampton, Philadelphia: Porter's Flora. Somerset: Stoystown, June 20, 1877, B. H. P.

7. *FESTUCA OBSTUSA* Spreng.

[Fig. 207]

Festuca nutans Spreng.

Festuca nutans Willd (Porter's Flora and others).

Culms 4-12 dm. high, glabrous or sometimes pubescent; sheaths shorter than the internodes, glabrous or pubescent; blades 1-3 dm. long, 4-7 mm. wide, smooth or scabrous beneath, scabrous or puberulent above; panicle loose, nodding 1-2 dm. long, often secund, branches bearing spikelets near the end; spikelets 3-5-flowered; first glume 1-nerved, about 3 mm. long, second 3-nerved, about 4 mm. long; lemma subacute, 4 mm. long. June-August.



Fig. 207. *Festuca obtusa*. A. Inflorescence; B. Spikelet.

This species is found in moist woods from Vermont, Ontario and Minnesota, southward to Georgia and Texas. It may be distinguished from *Festuca elatior* by its fewer-flowered spikelets, (3-5), its shorter lemma (4 mm.) and by the branches of the panicle being spikelet-bearing at the end.

Distribution in Pennsylvania.

Allegheny: Pittsburgh, June 4, 1887, B. H. P. Bucks, Chester: Porter's Flora. Cumberland: New Cumberland, July 5, 1920, E. M. G. Dauphin: Inglenook, June 12, 1922, E. M. G. Delaware: Porter's Flora. Erie: Presque Isle, June 9-11, 1905, O. E. J. Franklin, Huntingdon: Porter's Flora. Lancaster: Martic Hills, 1887, James Galen; McCall's Ferry, June 7, 1922, E. M. G. Monroe: Stroudsburg and Tobyhanna, May 29, 1921, E. M. G. Northampton: Easton, June 18, 1896, A. A. Tyler. Perry: Losh's Run, June 21, 1923, E. M. G. Philadelphia: Porter's Flora. Somerset: Stoystown, June 20, 1877, B. H. P. Venango, Wayne: Porter's Flora. Westmoreland Hillside, June 7, 1919, E. M. G.



Fig. 208. *Festuca shortii*.

8. FESTUCA SHORTII Kunth.

[Fig. 208]

This species is similar to *F. obtusa* Spreng, from which it differs in having a more compact panicle whose branches are spikelet-bearing from about the middle. The glumes, too, are each about 1 mm. longer and the lemma slightly broader and more obtuse.

There is some doubt whether this species occurs in Pennsylvania, although its range is given by Britton and Brown, 2nd. ed., and by Pammel, Ball and Scribner (Grasses of Iowa, Part II, 1903) from Pennsylvania to Iowa and southward to Texas. A specimen which is doubtfully placed here is in the Herb. of the Phila. Academy of Science collected at Pleasant Grove, Lancaster County, July 8, 1904, by J. J. Carter. It is also reported by Small and Carter in The Flora of Lancaster County, also by Keller and Brown (Flora of Phila. and Vicinity) from Dillerville Swamp, Lancaster County.

62. BROMUS L.

Brome Grass. Chess.

[Shear, Revision of North American Species of Bromus Occuring North of Mexico. U. S. Dept. Agr. Div. Agros. Bull. 23. 1900. Wiegand, K. M. East American Species of Bromus, Rhodora 24: 89. 1922.]

Annual or perennial grasses with flat leaves and large spikelets arranged in terminal panicles. Spikelets few-many-flowered; glumes unequal, 1-5-nerved, acute; lemmas longer than the glumes, rounded on the back, or sometimes compressed-keeled, 5-9-nerved, usually 2-toothed, awnless or awned from between the teeth or just below; palea a little shorter than the lemma; grain adherent to the palea.

Lower glume 1-nerved, the upper one 3-nerved.

Awns longer than the lemmas; annuals.

Second glume usually less than 1 cm. long; pedicels capillary and flexuous; awn 1-1.5 cm. long1. *B. tectorum*.

Second glume more than 1 cm. long; pedicels not capillary and flexuous; awn 2-3 cm. long2. *B. sterilis*.

Awns shorter than the lemmas, or wanting; perennials.

Panicle more or less drooping.

Lemmas pubescent on the margins only (smooth or nearly so in *B. ciliatus* var. *laevigatum*)3. *B. ciliatus*.

Lemmas pubescent all over the back.

Sheaths usually not overlapping, rather loosely pilose.4. *B. purgans*.

Sheaths overlapping, densely soft-pilose.5. *B. purgans incanus*.

Panicle erect6. *B. inermis*.

Lower glume 3-nerved, upper one 5-9-nerved.

Lemmas awned.

Lemmas densely pubescent with long silky hairs; perennial. 7. *B. kalmii*.

Lemmas glabrous, or pubescent with soft appressed hairs, not dense; annuals.

Lemmas pubescent8. *B. hordaceus*.

Lemmas glabrous or minutely roughened, not pubescent.

Lemmas with strongly inrolled margins, nerves obscure, leaf sheath glabrous9. *B. secalinus*.

Lemmas with the margins not inrolled, nerves prominent; leaf sheath softly and densely pubescent.

Panicle rather dense, short (7cm. or less), upright. 10. *B. racemosus*.

Panicle open, longer (1-2 dm.), drooping.11. *B. commutatus*.

Lemmas awnless or awn-pointed, nearly as broad as long. 12. *B. brizaeformis*.

1. BROMUS TECTORUM L.

[Fig. 209]

Downy Brome Grass.

An annual; culms 3-10 dm. high, tufted; sheaths longer than the internodes below, pubescent; blades 3-10 cm. long, 2-4 mm. wide, pubescent; panicle 6-15 cm. long, broad, rather dense, drooping, somewhat one-sided; spikelets 13-20 mm. long, nodding, numerous; glumes unequal, acuminate, hirsute; lemma, 8-12 mm. long, acuminate, pubescent; awn 12-15 mm. long. May-July.

Found in fields and waste places from Maine to Illinois and southward. This plant has come to us from Europe and is a troublesome

weed in some places. In some of the middle-western states it is spreading rapidly. It should be eradicated on first appearance. As it is an annual it will probably not be difficult to control.



Fig. 209. *Bromus tectorum* (Downy Brome Grass).

Distribution in Pennsylvania.

Bucks: Bristol, Porter's Flora. Dauphin: Harrisburg, May 27, 1921, W. A. McCubbin. Monroe: Tobyhanna, Aug. 1920, E. M. G., O. E. J., G. K. J. Northampton: Streets of Easton, Porter's Flora. Lackawanna: Vacant lot, Scranton, Aug. 1920, E. M. G.



Fig. 210. *Bromus sterilis* (Barren Brome Grass).

2. BROMUS STERILIS L.

[Fig. 210]

Barren Brome Grass.

An erect annual; culm 3-12 dm. high, simple, smooth; sheaths smooth, the lower sometimes pubescent; blades 7-20 cm. long, 2-6 mm. wide, usually pubescent; panicle 1-2 dm. long, broad, loose, drooping, the slender branches usually with but

one spikelet; spikelet 2.5-3.5 cm. long, spreading; glumes pointed, glabrous or slightly scabrous, unequal; lemma acuminate, scabrous on the nerves; awn 2-3 cm. long. June-July.

Introduced from Europe. Found in waste places and on river banks, Massachusetts to District of Columbia, Ohio, Illinois, Arkansas and Colorado. It is also found on the Pacific coast. No specimens from western Pennsylvania.

Distribution in Pennsylvania.

Bucks: Herb. Phila. Acad. Sc. Lancaster: Elizabethtown, June 8, 1922, E. M. G. Montgomery, Northampton, Philadelphia: Herb. Phila. Acad. Sc.



Fig. 211. *Bromus ciliatus* (Fringed Brome Grass).

3. BROMUS CILIATUS L.

[Fig. 211]

Fringed Brome Grass.

A perennial; culms slender, erect, 7-12 dm. high; sheaths often shorter than the internode, pubescent or nearly smooth; blade typically sparsely pilose on both surfaces, very variable, sometimes pubescent above and smooth beneath, or smooth on both surfaces; panicle lax and drooping, 1.5-2.5 dm. long, wide and spreading; spikelets 5-10 flowered, 1.5-2.2 cm. long; glumes unequal, smooth except for the scabrous keel, the lower 1-nerved, the upper 3-nerved; lemmas 8-12 mm. long, smooth on the back, very pubescent along the margin particularly toward the base, slightly bifid at the apex with a straight awn 3-5 mm. long. July-August.

Moist woods and thickets, Newfoundland to Manitoba, New York, New Jersey, Minnesota, and Texas. Some of Porter's specimens are found to be *B. purgans*, therefore the distribution in the state may be inaccurate.

Distribution in Pennsylvania.

Cambria: Johnstown, July 13, 1874, B. H. P. Chester: Porter's Flora. Crawford: Hartstown, July 31, 1918, E. M. G. Dauphin: Hummelstown, July 4, 1920, E. M. G. Delaware: In woods, Springfield, July 23, 1903, Benj. Smith. Erie: Porter's Flora. Fayette: Ohiopyle, Sept. 1, 1901, J. A. S. Franklin, Fulton, Lancaster, Philadelphia, Pike: Porter's Flora. Somerset: June 19, 1874, B. H. P.; Stoystown, Aug. 15, 1885, B. H. P.; Stoystown, Aug. 4, 1886, B. H. P. Wayne: Porter's Flora.



Fig. 212. *Bromus purgans* (Hairy Wood Chess).

4. BROMUS PURGANS L.

[Fig. 212]

Hairy Wood Chess.

Bromus ciliatus purgans A. Gray.

A perennial; culms erect, glabrous or pubescent at the nodes, 7-14 dm. high; sheaths usually shorter than the internodes, more or less pubescent, particularly near the top; blades 1.5-3 dm. long, 5-15 mm. wide, pubescent on the nerves above or smooth, glabrous or rough beneath; panicle large, loose, usually nodding; spikelets mostly 7-11 flowered, 2-2.5 cm. long; glumes sparsely pubescent, the lower 1-nerved, the upper 3-nerved; lemma usually 5-nerved, densely appressed-pubescent all over; awn straight, about 5 mm. long. June-August.

This species is found in moist rocky woods from western New England to Florida and westward to Wyoming and Texas. It frequently has been identified as *B. ciliatus*.

5. BROMUS PURGANS INCANUS Shear.

This variety is found in woods from Pennsylvania to Virginia and westward. It differs from the typical species form in having densely pilose, overlapping sheaths.

Distribution in Pennsylvania.

Allegheny: In woods along Narrow's Run, Moon Twp., July 20, 1901, J. A. S.; Frick's Woods, Pittsburgh, July 17, 1918, E. M. G.; Frick's Woods, Pittsburgh, June 20, 1886, B. H. P. Bradford: Sayre, Aug. 26, 1919, E. M. G. Dauphin: Hummelstown, July 10, 1920, E. M. G. Erie, Huntingdon: Porter's Flora. Lancaster: Flora of Martic Hills, 1887, Jas. Galen. Northampton: Porter's Flora. Somerset: Allegheny Mts. east of Somerset, Aug. 6, 1875, B. H. P.; Near Johnstown, July 13, 1874, B. H. P.; Stoystown, Aug. 4, 1886, B. H. P.; Mostollar, July 30, 1885, B. H. P. Warren: North Warren along Conewango Creek, Aug. 19, 1919, E. M. G. Westmoreland: Hillside, June 7, 1919, E. M. G.

6. BROMUS INERMIS Leyss.

Smooth Brome Grass.

"An erect, smooth perennial with a creeping rootstock and erect, broadly pyramidal or subcorymbose panicle. Culm rather stout, smooth, about 5-9 dm. high. Sheaths smooth; ligule 1.5-2 mm. long, subtruncate, somewhat lacerate; blades linear-lanceolate, flat, smooth or minutely scabrous, about 1.5-2.5 dm. long and about

5-10 mm. broad. Panicle rather dense, somewhat diffuse, 10-20 cm. long. Spikelets erect or somewhat drooping, narrow, terete, about 2-2.5 cm. long and 4-5 mm. wide after flowering; empty glumes smooth, the lower narrow, acute, 1-nerved, 4-5 mm. long, the upper subacuminate, three-nerved, about 6-8 mm. long; flowering glumes obtuse, emarginate, 5-nerved, about 9-12 mm. long, typically glabrous, but sometimes ciliate-pubescent on the lower half of the margins and the midrib, mucicous or with an awn sometimes reaching 3 mm. long; palea equaling the glume". Description from Shear, op. cit.

Bromus inermis and *B. pumpellianus* are very similar and Shear says that the difficulties in separating them are likely to be greatly increased in the future by the rapid distribution of the cultivated forms of *B. inermis* in the region occupied by *B. pumpellianus* and also by the probability of hybridization of the two plants.

It is difficult to decide to which of these two species our specimens belong. For instance, the length of the glumes (6-8 mm.) would place them in *B. pumpellianus* while the lack of dense pubescence on the lemma would place them in *B. inermis*. One of our specimens shows a very marked purple color, the others only a slight purple tinge. This color is probably not a constant character. The awn of the lemma varies in length reaching a maximum of about 3 mm.

This species has been introduced from Europe under the name of Hungarian or smooth brome grass. It is grown rather extensively in western U. S. for hay, where it is frequently found as an escape from cultivation. We may expect to find it in Pennsylvania since much seed is shipped into the state from that region.

Distribution in Pennsylvania.

Allegheny: Edge of wheat field, Glenshaw, June 29, 1919, E. M. G.
Lancaster: Along roadside, Lancaster, June 29, 1921, E. M. G.
Susquehanna: Freight yard, Montrose, July 14, 1922, E. M. G.



Fig. 213. *Bromus kalmii* (Kalm's Chess).

7. BROMUS KALMII Gray.

[Fig. 213]

Kalm's Brome Grass.

Kalm's chess.

A slender erect perennial, 5-10 dm. high; sheaths shorter than the internodes. pubescent or villous; blades usually pubescent or villous on both surfaces; panicle about 1 dm. long, loose and nodding; spikelets 7-12 flowered, 1.5-2.5 cm. long, densely silky pubescent all over; lower glume 3-nerved, the upper one 5-7-nerved; lemma 8-10 mm. long, obtuse with an awn 2-3 mm. long. June-August.

Found in dry, waste places from New England to Pennsylvania, Missouri, Minnesota, and northward.

Distribution in Pennsylvania.

Bucks, Huntingdon, Lancaster: Porter's Flora. Northampton: College Hill, Easton, July 1, 1898, Porter. Venango: Oil City, Sept. 17, 1876, B. H. P.



Fig. 214. *Bromus hordeaceus* (Soft Chess).

8. BROMUS HORDEACEUS L.

[Fig. 214]

Soft chess.

Bromus mollis L.

An erect, usually slender annual; culms, sheaths and blades usually pubescent; panicle erect, short (2-6 cm.), contracted; spikelets 3-8 flowered, 1.5-2 cm. long; glumes pubescent; lemma about 8 mm. long, obtuse, softly pilose; awn about 1 cm. long. June-August.

Found in fields and waste places, Nova Scotia to Virginia and North Carolina; Michigan, California. A variety *leptostachys* (Pers.) Beck. with glabrous or merely scabrous spikelets is found from Delaware to D. C.

Distribution in Pennsylvania.

Allegheny: June 19, 1886, B. H. P. Chester: Porter's Flora. Philadelphia: Porter's Flora, on ballast. Westmoreland: Derry, July 3, 1889, B. H. P.



Fig. 215. *Bromus secalinus* (Cheat or Chess).

9. *BROMUS SECALINUS* L.

[Fig. 215]

An erect annual, 4-9 dm. high; culms smooth or pubescent at the nodes; sheaths smooth and strongly nerved; blades 12-24 cm. long, usually smooth beneath, more or less pubescent above; panicle 8-16 cm. long, branches somewhat dropping; spikelets 5-15 flowered, 12-29 mm. long, smooth; glumes 5-7 mm. long; lemma 8-11 mm. long, smooth or minutely downy along the margins and toward the apex, becoming rounded in fruit by the inrolling of the margins; awns short and weak, usually 2-5 mm. long. July-August.

This grass was introduced from Europe and has spread through temperate parts of North America. It is common in waste places, and in grain fields where it becomes a weed and is known to the farmer usually as cheat. Being an annual, thorough cultivation will eradicate it.

Distribution in Pennsylvania.

Allegheny: Porter's Flora. Berks: June 17, T. J. Oberly (Ex. Herb. Guttenberg). Bucks, Chester, Delaware: Porter's Flora. Erie: Presque Isle, July 9, 1879, Guttenberg. Franklin, Huntingdon: Porter's Flora. Lackawanna: Vacant lot, Scranton, Aug 26, 1920, E. M. G. Lancaster: Martic Hills, 1887, Jas. Galen. Luzerne: Porter's Flora. Northampton: Easton, July 8, 1896, A. A. Tyler.

10. *BROMUS RACEMOSUS* L.

An annual; culms 3-6 dm. high, smooth or short pubescent below the panicle; sheaths shorter than the internodes and usually pubescent; blades pubescent; panicle about 5-8 cm. long, branches erect and rather short; spikelets 5-8 flowered, glabrous; glumes 6-8 mm. long; lemma about same length as the glumes with an awn about 1 cm. long.

This species is distinguished from *B. hordeaceus* by the glabrous spikelets and from *B. commutatus* by its shorter panicle with shorter and more erect branches. There is one specimen in the Herbarium of the Carnegie Museum collected by Jas. Galen in Lancaster County in 1886. It is labeled *B. racemosus*; I think it is *B. commutatus* Schrad. There is a specimen in the Herb. of the Philadelphia Academy of Science, which was collected on ballast in Philadelphia. Porter's Flora gives it from the following counties: Bucks, Erie, Franklin, Lancaster, Montgomery, Northampton, Philadelphia. Porter, however, does not list *B. commutatus* Schrad., probably having considered them both under the species *B. racemosus* L. Gray's Manual 7th ed. gives its range from "Quebec to Delaware, rare."



Fig. 216. *Bromus commutatus* (Upright Chess).
A. Inflorescence; B. Spikelet.

11. BROMUS COMMUTATUS Schrad.

[Fig. 216]

Upright Chess.

An erect annual, 3-7 dm. high; sheath pubescent; blades rather long, lax and pilose-pubescent; panicle open, drooping, 1-2 dm. long; spikelets 12-20 mm. long, ovate or oblong; 5-10 flowered; glumes broad, the lower 3 or faintly 5-nerved, the upper 7 or faintly 9-nerved; lemma 9-10 mm. long, obtusely angled along the thin margin above the middle, smooth; awn about 6 or 7 mm. long, straight. June-July.

This is a very common grass in Pennsylvania. It is found from Newfoundland to District of Columbia and westward to Michigan, Minnesota, and Nebraska. It is similar to *B. racemosus* but differs from it in having a more open and larger panicle.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 25, 1917, E. M. G.; edge of cultivated field, Guyasuta, June 1, 1918, E. M. G.; Glenshaw, June 6-8, 1918, E. M. G. Cumberland: New Cumberland, July 4, 1920, E. M. G. Dauphin: About Harrisburg, Summer, 1921, E. M. G. Fayette: Jacob's Creek, below the old Furnace, Aug. 10, 1902, J. A. S. Greene: Rices Landing July 9, 1907, J. A. S. Washington: Riverview along Charleroi street car line, June 22, 1919, E. M. G. Westmoreland: Ligonier Valley near Kingston, June 8, 1919, E. M. G.

12. BROMUS BRIZAEFORMIS Fisch. & May.

[Fig. 217]

Awnless Brome Grass.

An annual; culms 1-6 dm. high; sheaths softly villous; blades 3-18 cm. long, 2-6 mm. wide, pubescent; panicles 3.5-20 cm. long, branches slender, drooping; spikelets 1.3-2.5 cm. long, broadly ovate; glumes unequal, first 3-5-nerved, second

5-9-nerved; lemmas 6-10 mm. long, nearly as wide, 9-nerved, awnless, (sometimes some lemmas of the spikelets may bear a short awn while the others are awnless). July-August.



Fig. 217. *Bromus brizaeformis* (Awnless Brome Grass).

This species has been introduced from Europe and is found from Massachusetts to Delaware, Michigan, and Indiana; also in western United States. It is rare in Pennsylvania, having been found, so far as is known to the writer, only in Lancaster County as reported in Porter's Flora, and in the Flora of Lancaster County which gives it as rare, in fields and thickets near Smithville. No specimen from the state has been seen.

63. PHOLIURUS Trin.

Slender Hard Grass.

A low branching annual grass with slender cylindrical straight or curved terminal spikes which disarticulate at maturity, the joints falling with the spikelets attached. Spikelets 1-flowered, awnless, solitary, alternate, in notches of the rachis; glumes equal, placed edge to edge in front of the florets, except in the terminal spikelet, rigid, acute; lemma much smaller than the glumes, hyaline, keeled.

PHOLIURUS INCURVATUS (L.) Hitchc.

Slender Hard Grass.

Lepturus filiformis (Roth.) Trin.

[Hitchcock, The Genera of Grasses of the U. S., U. S. Dept. of Agr., Bull. 772, 1920.]

Culms tufted, 1-3 dm. high, decumbent at base, smooth; sheaths shorter than the internodes; blades 1-5 cm. long, 2 mm. wide or less, usually involute, smooth beneath, rough above; spikes 3-10 dm. long, included at the base in the sheath, slender strict or curved; spikelets 4-5 mm. long, 1-flowered, single, in alternate notches of the jointed rachis; glumes acute; lemmas about 3.5 mm. long.

This grass is found in waste places and borders of brackish marshes from Pennsylvania to Virginia along the coast. It is rare, if found at all, in Pennsylvania. The writer has seen no specimens from the state and has no definite knowledge of its being found in Pennsylvania. Britton and Brown 2nd. ed. vol. I: 282, gives it for southern Pennsylvania.

64. LOLIUM L.

Rye Grass.

Annual or perennial grasses with simple erect stems, flat leaves and terminal spikes. Spikelets several-flowered, solitary, sessile and alternate, with the edge

turned toward the rachis; the glume on the edge of the spikelet toward the rachis wanting except in the terminal spikelet, second glume rigid, 5-7-nerved; rachilla flattened; lemmas rounded on the back, 5-7-nerved, awned or awnless; grain adherent to palea.

Glumes shorter than the spikelet.

Lemna awnless1. *L. perenne*.

Lemna awned2. *L. multiflorum*.

Glumes equaling or longer than the spikelet3. *L. temulentum*.



Fig. 218. *Lolium perenne* (Perennial Rye Grass).
A. Inflorescence; B. Spikelet.

1. *LOLIUM PERENNE* L.

[Fig. 218]

Perennial Rye Grass.

A tufted, usually short-lived perennial; culms 3-6 dm. high, glabrous; sheaths smooth; blades 5-12 cm. long, 2-4 mm. wide, smooth, auricled at the base; the slender spikes 6-20 cm. long, axis glabrous except at the angles; spikelets 10-12 mm. long, 5-10 flowered, glume shorter than the spikelet; lemma about 5-6 mm. long, awnless. July-August.

This species has been naturalized from Europe. It is found in waste places and cultivated ground almost throughout the U. S. It is a good forage plant but does not persist long. The genus *Lolium* is easily identified by its spikelets being placed with one edge to the rachis.

Distribution in Pennsylvania.

Allegheny: Edgewood, June 30, 1917; Nov. 9, 1919, E. M. G.; Glen-shaw, June 8, 1919, E. M. G.; Shenley Park, Pittsburgh, June 25, 1901, J. A. S. Berks, Bucks, Chester: Porter's Flora. Crawford: Conneaut Lake, July 23-25, J. A. S. Delaware, Erie: Porter's Flora. Fayette: Point Marion, July 9, 1901, J. A. S. Franklin: Porter's Flora. Greene: Gray's Landing, July 9, 1901, J. A. S. Northampton: Easton, June 8, 1898, Porter. Philadelphia: Porter's Flora. Somerset: Stoystown, Aug. 14, 1874; Aug. 17, 1875; Aug. 6, 1885, B. H. P.



Fig. 219. *Lolium multiflorum* (Awned or Italian Rye Grass).

2. LOLIUM MULTIFLORUM Lam.

[Fig. 219]

Awned or Italian Rye Grass.

Lolium italicum A. Br.

A biennial or perennial tufted grass; culms 6-9 dm. high, usually nodding, erect, geniculate at the base at least late in the season and rooting at the lower crowded nodes; lower sheaths smooth, upper ones rough; ligule short, membranous; blades 10-20 cm. long, 4-6 mm. wide, smooth, the uppermost slightly rough, auricles at the base very prominent on the branches arising from the lower nodes; spikes 2-3 dm. long, axis rough; spikelets 6-20 flowered, 10-15 mm. long; glume shorter than the spikelet; lemmas containing a slender awn about equal to their own length. June-August.

This species is a rapid grower and a good forage plant but does not persist very long. It has been introduced from Europe and has escaped, being used in many lawn mixtures.

Distribution in Pennsylvania.

Allegheny: Newly made lawn of the Presbyterian Church in Edgewood, Nov. 9, 1919, E. M. G. Dauphin: Hershey, Aug. 26, 1921, E. M. G. Lancaster: Pequea, Herb. Phila. Acad. Sc. Wayne: At R. R. Station, Waymart, Aug. 23, 1920, E. M. G., O. E. J., G. K. J.



Fig. 220. *Lolium temulentum* (Poison Darnel).

3. *LOLIUM TEMULENTUM* L.

[Fig. 220]

Poison Darnel.

An annual; culms 5-10 dm. high, erect, smooth; sheaths smooth; blades 1-2.5 dm. long, 2-6 mm. wide, rough on the upper surface; spikes 1-3 dm. long; spikelets 4-8 flowered, 10-18 mm. long; glumes longer than the spikelet, sometimes almost thorn-like; lemmas sometimes awned. June-August.

Found in waste places and cultivated fields from New Brunswick to Michigan, Georgia, and Kansas, and on the Pacific Coast. It has been introduced from Europe and is a troublesome weed in places. It was formerly supposed to yield a narcotic poison which is now said to be due to a poisonous fungus in the fruit. "This plant is said to be the one referred to in scripture in the parable of the tares." Hitchcock, *A Text-Book of Grasses*, page 237. It is easily distinguished by the glumes which are longer than the spikelets.

Distribution in Pennsylvania.

Adams: In wheat fields, June 15, 1921, W. A. Kline. Bucks: Herb. Phila. Acad. Sc. Delaware: Herb. Phila. Acad. Sc.; Porter's Flora. Northampton: Porter's Flora. Philadelphia: On Ballast, Porter's Flora.

65. *SECALE* L.

Rye.

Tall annual grasses with flat leaves and simple culms. Spikelets single at the nodes of the spike and with their sides to the rachis which is continuous in the cultivated species but disarticulating in the wild ones, 2-flowered; glumes lanceolate, awn-pointed; lemmas keeled, the keel hispid-ciliate, awned; grain grooved, hairy at the apex, free.

SECALE CEREALE L.

Cultivated Rye.

Culms usually pubescent below the spike, otherwise smooth, usually glaucous, erect, 1-1.5 m. high, sheaths smooth; blades flat 6-12 mm. wide, scabrous, auricled; spike 6-12 cm. long, somewhat nodding; spikelets 2-flowered or with a third rudimentary floret; glumes narrow, scabrous on the keel; lemma lanceolate, compressed, 5-nerved, ciliate on the keel and margin, awned. May-July.

Often found in vacant lots in cities, in cultivated field and waste places and along railroads. Escapes from cultivation; may be found anywhere in the state.

66. *TRITICUM* L.

Wheat.

Tall annual grasses with flat leaves and simple erect culms. Spikelets single at the nodes of the spike and with their sides turned to the rachis; spikelets 2-6 flowered; glumes ovate; lemmas rounded on the back, many-nerved, ending in 1 or more points or awns; palea 2-keeled; grain free, grooved, hairy at the apex. There are many varieties of cultivated wheat, those bearing long awns are called bearded wheats; the awnless or short-awned are called beardless or smooth wheat.

TRITICUM AESTIVUM L.*Triticum vulgare* Vill.*Triticum sativum* Lam.

Cultivated Wheat.

Culms tufted, erect, 6-10 dm. high; sheaths smooth or slightly scabrous, or the lowermost pubescent; blades flat, usually more than 1 cm. wide, more or less scabrous on the upper surface, auricled at the base; spikes dense, more or less

4-sided, 4-10 cm. long; spikelets overlapping, single at the nodes, in 2 rows, alternating on the zigzag continuous rachis, usually 3-5-flowered; glumes unsymmetrical; lemmas more or less 3-toothed, the central tooth sometimes long-awned (bearded).

This is the only species grown in America but there are many different varieties, differing in shape of spike or head, length of awn, pubescence of spikelets and many other characters. It is not established in our flora and is found only where it has been accidentally scattered. It may be found anywhere in the state in such places as along railroads, near grain elevators, and in fields where it has come up spontaneously after cultivation.

67. AGROPYRON Gaertn.

Couch Grass.

Wheat Grass.

Perennial grasses with simple culms, flat or involute leaves and terminal spikes. Spikelets 3-many-flowered, solitary in the notches of the rachis, the side of the spikelets placed against the rachis; glumes equal, opposite or placed edge to edge on the outer side of the spikelets, rigid, usually shorter than the floret, acute or awned; lemmas 5-7 nerved, acute or awned; palea shorter than the lemma, bristly-ciliate on the keels; grain pubescent at the summit, usually adherent to the palea.

Culms solitary or few, erect from a creeping root-stock.1. *A. repens*.

Culms tufted, no creeping root-stock.

Awn not longer than the lemma2. *A. tenerum*.

Awn about twice as long as the lemma.3. *A. caninum*.



Fig. 221. *Agropyron repens* (Couch Grass. Quack Grass).
A. Portion of rootstock and stem; B. Inflorescence; C. Spikelet.

1. AGROPYRON REPENS (L.) Beauv.

[Fig. 221]

Couch Grass.

Quack Grass.

Triticum repens L.

A creeping yellowish green rootstock; culms erect, bright green or glaucous, 3-12 dm. high; sheaths smooth, the lower often pubescent or pilose; ligule very short; blades flat or inrolled, rough and usually sparsely pubescent above; spike 5-15 cm.

long; spikelets about 5 (4-8) flowered, 10-15 mm. long; glumes 8-10 mm. long, acuminate or awn-pointed, strongly nerved; lemmas about 1 cm. long, glabrous or often rough, strongly nerved, sharply pointed or short awned. June-September.

This grass is common along roadsides and in cultivated fields. It is a troublesome weed in some places and, although it makes a good forage grass, should not be introduced as forage plant on account of its weedy nature. It may be destroyed by thorough and persistent cultivation. It is found throughout nearly all of North America except in the extreme north. Used as a medicine for kidney trouble.

Distribution in Pennsylvania.

Allegheny: June 30, 1917, E. M. G. Bucks, Delaware: Porter's Flora. Erie: Erie, July 6, 1879, Guttentberg. Jefferson, Lancaster, Northampton, Philadelphia: Porter's Flora. Somerset: Stoystown, 1877, B. H. P. This plant can probably be found in every county in the State.

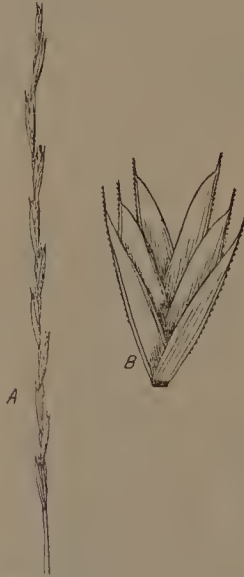


Fig. 222. *Agropyron tenerum* (Slender Wheat Grass).
A. Inflorescence; B. Spikelet.

2. AGROPYRON TENERUM Vasey.

[Fig. 222]

Slender Wheat Grass.

Agropyron novae-angliae Scribn.

Culms erect, stiff, smooth, 5-10 dm. high; leaves rigid, narrow, flat, or involute in drying; spikes slender, cylindrical, green or straw-colored, 8-15 cm. long; spikelets 3-5 flowered; glumes five-nerved, firm, nearly as long as the spikelet, the scarious margin narrow, tapering gradually into the awned point; lemma lanceolate, 8-10 mm. long, tipped with a straight awn, 4 mm. long. July-August.

The only specimen of this species from Pennsylvania seen by the writer was in the Herbarium of the Philadelphia Academy of Sciences. Apparently it is rare in the state. It is considered an excellent forage plant in the Rocky Mountains. Newfoundland to Pennsylvania, and Minnesota, and in the far west.



Fig. 223. *Agropyron caninum* (Awned Wheat Grass).

3. AGROPYRON CANINUM (L.) Beauv.

[Fig. 223]

Awned Wheat Grass.

No creeping rootstock; culms erect, 3-10 dm. high; sheaths smooth, or the lower hairy; ligule short; blades flat, scabrous; spike more or less nodding, at least in the fruit, 6-15 cm. long; spikelet 3-6 flowered, 12-15 mm. long, exclusive of awns; glumes 3-5 nerved, acute or awned; lemmas 3-5 nerved; awns straight or somewhat spreading, about twice the length of the lemma. July-September.

This species is considered a good forage plant. It is not common in Pennsylvania, at least in the western part of the state. Distributed along our northern borders and south to N. C., Tenn., Iowa, and Colorado. Pease and Moore, *Agropyron caninum* and its N. A. Allies, Rhodora 12:61-77, 1910.

Distribution in Pennsylvania.

Crawford: Hartstown, Aug. 1, 1918, E. M. G. Monroe: Tobyhanna, Aug. 13, 1920, E. M. G., O. E. J., G. K. J. Monroe and Pike: Porter's Flora.

68. ELYMUS L.

Wild Rye, Lyme Grass.

[Wiegand, K. M., Some Species and Varieties of Elymus. Rhodora 20: 81-90. 1918.]

Tall perennials with flat leaves and dense terminal spikes. Spikelets 2-6-flowered, in pairs, occasionally in 3's or more, sessile at the alternate notches of the continuous rhachis; rachilla articulated above the glumes and between the florets; glumes equal, rigid, narrow, acute or awn-pointed, placed edge to edge in front or toward the sides of the florets; lemmas convex, obscurely 5-nerved, obtuse, acute or awned; paleas slightly shorter than the lemmas; grain hairy at the summit, adherent to the lemma and palea.

- Awns straight when mature and dry; palea 5.2-8 (rarely 8.5-9.2 in *E. virginicus*) mm. long.
- Glumes broad (.9-2 mm. wide), strongly indurated and more or less curved at the base.
- Glumes 1-2.7 cm. long; lemmas 1-3 cm. long.
- Glumes and lemmas more or less awned.
- Lemmas and glumes glabrous or merely scabrous on the margins.
- Lemmas and glumes villous-hirsute ..2. *E. virginicus* var. *hirsutiglumis*.
- Glumes and lemmas awnless or nearly so. 3. *E. virginicus* var. *submuticus*.
- Glumes 2.7-4 cm. long; lemmas 3.5-4.5 cm. long; spikes exserted.
- Glumes and lemmas villous-hirsute4. *E. australis*.
- Glumes and lemmas strigose-scabrous or glabrous. 5. *E. australis* var. *glabriflorus*.
- Glumes narrow, often setiform (.4-.8 mm. wide), indurated and terete below, essentially straight.
- Palea 7.5-8 mm. long; rachis-joints 3-4.5 (rarely 5-8) mm. long; spikelets 2-4-flowered; leaves and sheaths scabrous6 *E. riparius*.
- Palea 5.2-6.7 mm. long; spikelets 1 (rarely 2)-flowered; leaves villous.
- Lemmas and glumes villous-hirsute7. *E. striatus*.
- Lemmas and glumes glabrous or slightly strigose. 8. *E. striatus* var. *arkansanus*.
- Awn curved outward toward the apex when mature and dry; palea 9-11 (rarely 15) mm. long.
- Leaves rather thin, 13-20 mm. wide, usually somewhat villous above; spike slender and rather loose; glumes 15-20 (rarely 8-27) mm. long
- 9 *E. canadensis*.
- Leaves firm, 5-15 mm. wide, tending to be involute when dry, usually glabrous; spikes somewhat denser; glumes 20-25 (rarely 15-35) mm. long.
- Lemmas glabrous or sparsely hispidulous10. *E. robustus*.
- Lemmas villous-hirsute11. *E. robustus* var. *vestitus*.



Fig. 224. *Elymus virginicus* (Virginia Wild Rye).
A. Inflorescence; B. Spikelet.

1. ELYMUS VIRGINICUS L.

[Fig. 224]

Virginia Wild Rye.

Culms stout, 6-10 dm. high; sheaths usually smooth, upper one inflated and usually including the base of the spike; blades 1.2 cm. wide or less, glabrous or somewhat villous above, spikes 4-14 cm. long, straight, included at base or short-

exserted; spikelets 2-4 flowered; glumes broad (1.5-2 mm.), smooth, with an awn 1.4-2.7 cm. long, strongly indurated and curved at the yellowish rounded base; lemmas smooth; awn 4-18 mm. long.

This species is common in moist places and along river banks. It is found from Newfoundland and Quebec to District of Columbia and westward to Montana and Colorado, and southward in the central states to Louisiana and Texas. Two marked distinguishing characters are the inflated upper sheath which usually includes the lower part of the spike and the strongly curved glumes which are hard and yellow at the base.

Distribution in Pennsylvania.

Allegheny, Bucks, Blair, Chester: Porter's Flora. Crawford; Harts-town, Aug. 1, 1918, E. M. G.; Conneaut Lake, July 23-25, 1901, J. A. S. Delaware, Erie, Franklin, Lancaster: Porter's Flora. Mercer: Houston Junction, July 17, 1902, J. A. S. Northampton, Philadelphia: Porter's Flora. Somerset: Stoystown, July 11, 1877, B. H. P.

2. *ELYMUS VIRGINICUS* var. *HIRSUTIGLUMIS* (Scribn.) Hitchc.

Elymus hirsutiglumis Scribn.

Elymus intermedius Scribn. & Smith.

This variety differs from the species in the villous-hirsute lemmas and glumes. It is found on river banks from Maine to Virginia and westward to Missouri and Nebraska.

Distribution in Pennsylvania.

Fayette: Ohiopyle, Aug. 18, 1918, E. M. G. Lehigh: Sept. 3, 1916, Pretz. Montgomery, Philadelphia: Herb. Phila. Acad. Sc.

3. *ELYMUS VIRGINICUS* var. *SUBMUTICUS* Hooker.

This variety differs from the species in the almost complete absence of awns on both glumes and lemmas. Found from Massachusetts to Ohio, Illinois and westward to Nebraska, Kansas and Oklahoma, also in Washington.

Distribution in Pennsylvania.

Allegheny: Glenshaw, Aug. 31, 1918, E. M. G.

4. *ELYMUS AUSTRALIS* Scribn. & Ball.

[Fig. 225]

[Div. Agros. Bull. 24: 49. 1901. Rhodora 20: 84. 1918.]

Southern Wild Rye.

"Leaves 12 mm. wide or less, thin, sparingly villous above, rarely glabrous, green or slightly glaucous: upper sheaths scarcely inflated: spikes more or less exserted, straight, 8-14 cm. long: joints of the rachis 3-6 mm. long: spikelets usually slightly spreading, 2-4-flowered: glumes elongated, of medium breadth (2.7-4 cm.

long, 0.9-1.1 mm. wide), thick and indurated toward the curved, usually unstriated, yellowish base, villous-hirsute: lemmas 3.5-4.5 cm. long, villous-hirsute: awn long and straight: palea 7-8 mm. long: grain 5 mm. long."



Fig. 225. *Elymus australis* (Southern Wild Rye).

A. Inflorescence; B. Spikelet.

This species is found in swampy woods and on banks of streams, along the coast from eastern Massachusetts to Georgia; also in Missouri and Nebraska. It resembles *E. virginicus* and *E. canadensis* especially the former. Its glumes, lemmas and awns are, however, longer and its spikes more regularly exerted than those of *E. virginicus*; also the glumes and lemmas are villous-hirsute while those of *E. virginicus* (not *E. virginicus hirsutiglumis*) are glabrous. From *E. canadensis* it may be distinguished by its straight awns (not curved outward when mature and dry), and by its shorter palea which is 7-8 mm. long, while those of *E. canadensis* are 8-15 mm. long.

On account of this species having been confused with the above two which it resembles, its distribution cannot be given with certainty. A specimen collected at Columbia, Lancaster County, July 11, 1919, by the writer and referred to Prof. K. M. Wiegand, was identified by him as *E. australis*. Small and Carter (Flora of Lancaster County) do not list *E. australis*, but do give *E. hirsutiglumis*. The plant which they refer to is probably not *E. hirsutiglumis* but *E. australis*.

5. *ELYMUS AUSTRALIS* var. *GLABRIFLORUS* (Vasey) Wiegand

E. canadensis var. *glabriflorus* Vasey.

E. glabriflorus Scribn & Ball.

This variety differs from the typical form in its glabrous or merely strigose-scabrous glumes and lemmas. It is found on dry banks and in

woods in Massachusetts and from Maryland to Florida and westward through Tennessee and Illinois to Nebraska and Texas. It is reported from Lancaster County by Small and Carter (Flora of Lancaster County) and by Porter (Porter's Flora) from Northampton County.



Fig. 226. *Elymus riparius*. A. Inflorescence; B. Spikelet.

6. ELYMUS RIPARIUS Wiegand.

[Fig. 226]

[Wiegand, Rhodora 20: 84. 1918.]

"Plant tall; leaves 7-25 mm. broad, thin, green or slightly glaucous, scabrous; sheaths close, smooth; spikes much exserted, slightly nodding, 7-20 cm. long, exclusive of the awns; spikelets 2-4-flowered, somewhat spreading; joints of the rachis 3-4.5 rarely 5-8 mm. long; glumes very slender (0.4-0.8 mm. wide, 1.8-3 cm. long), terete, and indurated toward the nonstriate, yellowish, straight base; lemma (2.2-) 3-4.5 cm. long, minutely and sparsely hispidulous; awns long and straight; palea 7.5-8 mm. long; grain 5-6 mm. long."

This is a new species described by Wiegand, l. c. It is found along the banks of streams and in alluvial bottom lands. It is found from Maine to western New York and southward to the mountains of Virginia, West Virginia, and Kentucky. It is our most common species along river banks in Pennsylvania.

Distribution in Pennsylvania.

Allegheny: Saunders, Sept. 20, 1919, E. M. G.; Etna, Sept. 14, 1918, E. M. G.; Dixmont, Sept. 28, 1919, E. M. G. Armstrong: Near Fox-

burg, Aug. 13, 1919, E. M. G. Cambria: Stony Creek, Johnstown, Aug. 20, 1874, B. H. P. Clarion: Along Clarion River, Foxburg, Aug. 13, 1919, E. M. G. Crawford: Hartstown, Sept. 13, 1919, and Aug. 15, 1919, E. M. G. Fayette: Ohiopyle, Sept. 1, 1901, J. A. S. Lycoming: Williamsport, Aug. 24, 1919, E. M. G. Northampton: Delaware above Easton, Aug. 15, 1899, Porter. Warren: North Warren, along river, Aug. 19, 1919, E. M. G.



Fig. 227. *Elymus striatus* (Slender Wild Rye).
A. Inflorescence; B. Spikelet.

7. ELYMUS STRIATUS Willd.

[Fig. 227]

Slender Wild Rye.

Elymus villosus Muhl. in Willd.

Elymus striatus var. *villosus* Gray.

Elymus striatus var. *bullii* Pammel.

Culms slender, 5-10 dm. high; sheaths smooth or with a few fine hairs; blades 15-20 cm. long, 6-10 mm. wide, villous on upper surface; spikes 4-10 cm. long, exserted, slightly nodding, rachis joints 1.5-3 mm. long; spikelets 1-2 flowered; glumes 4-6 mm. wide, 1.4-3 cm. long, hardened and yellow toward the base, very slightly bowed or straight, villous, 2.3-5 cm. long, including the awn. July-August.

This species is found in rocky woodlands and thickets from Maine to North Carolina and westward to Wisconsin, Nebraska, and Oklahoma. It is difficult to list its location since all botanists do not make the same distinction between the species and the varieties.

Distribution in Pennsylvania.

Bucks: Herb. Phila. Acad. Sc.; Porter's Flora. Chester, Delaware, Franklin, Huntingdon: Porter's Flora. Lancaster, Lehigh: Herb. Phila. Acad. Sc. Mercer: Neshannock Creek, July 17, J. A. S. Northampton: Easton, July 1, 1896, A. A. Tyler; Aug. 15, 1899, Porter. Philadelphia: Herb. Phila. Acad. Sc.; Porter's Flora. Westmoreland: Ohiopyle, Sept. 1, 1901, J. A. S.

8. *ELYMUS STRIATUS* var. *ARKANSANUS* (Scribn. & Ball) Hitchc.*Elymus arkansanus* Scribn. & Ball.

This variety differs from the typical form of the species in the almost completely glabrous glumes and lemmas. Found in rocky woods. In the Southern States as far north as Maryland according to Hitchcock (Flora of the District of Columbia and Vicinity, 1919). According to Scribner and Ball in Iowa, Missouri and Arkansas. Wiegand, Nebraska and Virginia (Rhodora 20: 87, May, 1918). In Illinois by V. H. Chase.

Distribution in Pennsylvania.

Philadelphia: Along the rocky, wooded bank of the Wissahickon Creek, Aug. 3, 1919, E. M. G.



Fig. 228. *Elymus canadensis* (Nodding Wild Rye).
A. Inflorescence; B. Spikelet.

9. *ELYMUS CANADENSIS* L.

[Fig. 228]

Nodding Wild Rye.

Elymus philadelphicus L.*Elymus glaucifolius* Muhl.*Elymus canadensis* var. *glaucifolius* Torr.

Culms green or glaucous, 6-15 dm. high; leaves thin, flat, 1-2 cm. wide, villous on the upper surface or nearly glabrous; spikes exserted, 10-30 cm. long, rather loose, flexuous and nodding; spikelets 3-7-flowered; glumes slightly indurated at base, straight, glabrous or hirsute; lemmas villous-hirsute or almost glabrous, awns long and curved when mature and dry; palca 9-15 mm. long.

This species is found in alluvial or sandy soil from Nova Scotia to Manitoba and southward. Often identified as *E. robustus* or *E. riparius*. Common northward.

Distribution in Pennsylvania.

Allegheny: Banks of Allegheny River, Sept. 23, 1889, J. A. S. Bedford: Porter's Flora. Bradford: Sayre, Aug. 26, 1919, E. M. G. Bucks, Chester, Delaware, Erie, Lancaster: Porter's Flora. Northampton: On the Delaware above Easton, Aug. 15, and July 22, 1899, Porter. Philadelphia: Porter's Flora. Wayne: White Oak Pond, Aug. 24, 1920, E. M. G., O. E. J., G. K. J.

[Note:—Those reported by Porter's Flora have not been verified.]

10. *ELYMUS ROBUSTUS* Scribn. & Smith.

Great Lyme Grass.

[Rhodora 20: 89. 1918.]

Elymus brachystachys Scribn. & Ball.

Clums stout, leafy, 9-18 dm. high; leaves 5-15 mm. wide, firm, smooth, involute in drying; spikes long-exserted, 8-20 cm. long, robust, dense: spikelets mostly 3-4-flowered, 13-17 mm. long; glumes slightly indurated below, glabrous or nearly so; lemmas scabrous, or sparingly hispidulous, 2.8-5 cm. long inclusive of the awns which are spreading and curved outward when mature and dry; palea 8.5-11 mm. long.

This species is found on sandy or gravelly shore from New England westward to Illinois, Michigan and Montana and south to Texas and New Mexico.

11. *ELYMUS ROBUSTUS* var. *VESTITUS* Wiegand.

[Fig. 229]

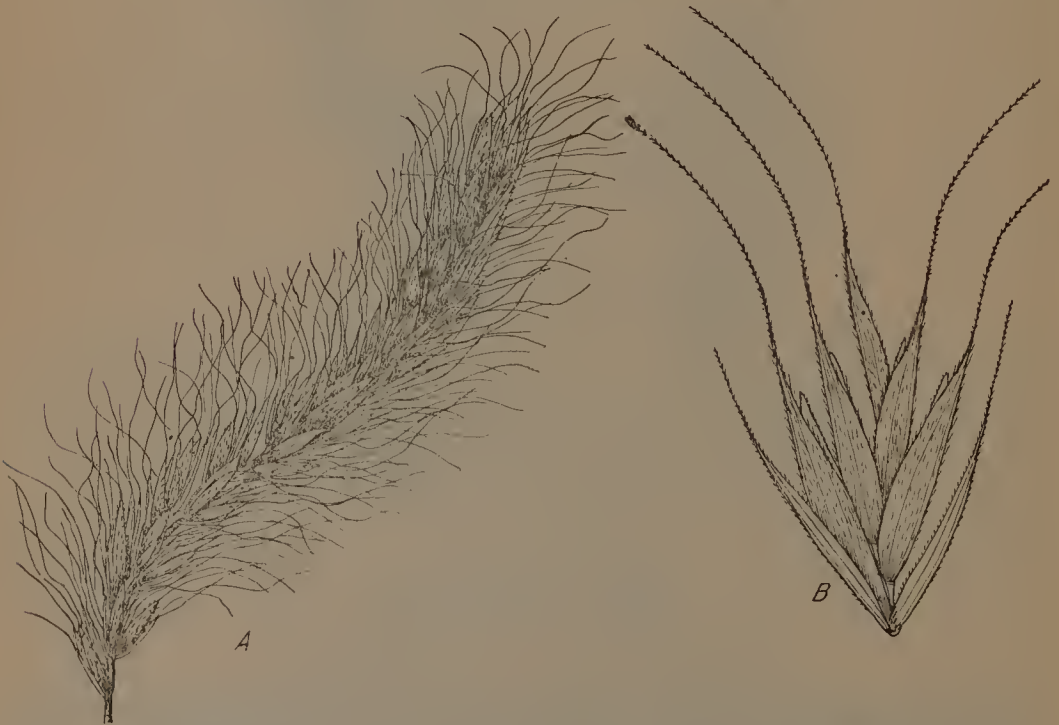


Fig. 229. *Elymus robustus* var. *vestitus* (Great Lyme Grass).

A. Inflorescence; B. Spikelet.

This variety differs from the species in having villous-hirsute lemmas. All the specimens seen from the state belong to the variety and not to the typical species form. They are listed below. *Elymus*

robustus and the variety *vestitus* have been identified by some collectors as *E. canadensis*, therefore the distribution of all must be uncertain. The typical species form of *E. robustus* is probably found in the state.

Distribution in Pennsylvania.

Allegheny: Six Mile Island, Ohara Twp., Aug. 9, 1898, S. N. Rhodes. Erie: Presque Isle, Aug. 12, 1879, Guttenberg.; Sept. 9-11, 1900, J. A. S.; Aug. 16-17, 1919, E. M. G.; Bog Run, near Erie, July 28, 1879, Guttenberg.

69. HYSTRIX Moench.

Bottle-brush Grass.

Tall perennial grass with simple culms, flat leaves and loosely-flowered terminal spikes. Spikelets 2-4-flowered in pairs, rarely in 3's, at each node of the flattened continuous rachis, widely divergent at maturity; glumes wanting or sometimes appearing as mere rudiments; lemmas convex, rigid, tapering into a long awn; palea strongly 2-keeled; grain pubescent at the summit, adherent to the palea when dry.



Fig. 230. *Hystrix patula* (Bottle-brush Grass).

HYSTRIX PATULA Moench.

[Fig. 230]

Bottle-brush Grass.

Hystrix hystrix (L.) Millsp.

Elymus hystrix L.

Asprella hystrix Willd.

Gymnostichum hystrix Schreb.

Culms simple, erect, 6-12 dm. high, smooth; sheaths smooth; blades 1-2 dm. long, 6-15 mm. wide, scabrous; spikes 6-12 cm. long, exserted or partially included;

spikelets 8-15 mm. long, exclusive of awns, at first erect but later spreading almost at right angles to the rachis; glumes reduced to awns and one or both often wanting, usually present in the lowermost spikelets; lemmas smooth or pubescent, tapering into an awn 1.5-4 cm. long. June-July.

This grass which resembles the wild ryes, but which has a much less compact spike, is found in moist woods from New Brunswick to Ontario and southward to Georgia, Illinois and Nebraska.

Distribution in Pennsylvania.

Allegheny: Common. Armstrong: Kittanning, 1902, D. R. Sumstein. Bucks: Porter's Flora. Cambria: Johnstown, July 13, 1874, B. H. P. Chester: Porter's Flora. Crawford: Conneaut Lake, July 25, 1901, J. A. S. Dauphin: Hummelstown, July 4, 1920, E. M. G. Delaware: Newton, July 25, 1903, B. H. Smith. Erie, Franklin, Huntingdon: Porter's Flora. Indiana: Blairsville Intersection, Aug. 8, 1901, J. A. S. Lancaster, Luzerne: Porter's Flora. Monroe: Delaware Water Gap, Aug. 3, 1920, E. M. G., O. E. J. Northampton: Easton, July 16, 1896, A. A. Tyler. Perry: Shermandale, July 22, 1921, E. M. G. Philadelphia: Porter's Flora.

70. HORDEUM L.

Barley.

Annual or perennial grasses with flat leaves and terminal spikes. Spikelets 1 (rarely 2)-flowered, usually in 3's at each joint of the rachis which disarticulates at maturity, the joints falling with the spikelets attached, the middle spikelet is sessile and perfect, the lateral ones pedicelled, often reduced to awns which together with the glumes of the perfect spikelets appear like a bristly involucre. rachilla prolonged behind the palea as an awn, sometimes with a rudimentary floret; glumes equal, rigid, narrow, subulate or setaceous; lemma obscurely 5-nerved, tapering into an awn; palea slightly shorter than the lemma; grain hairy at the summit, usually adherent to the palea.

All three spikelets at each node of the rachis fertile. 1. *H. vulgare*.
Only the middle spikelet at each node of the rachis fertile.

Awn of the lemma 25 mm. or more long.

Glumes not ciliate 2. *H. jubatum*.

Glumes at least some of them, ciliate. 3. *H. murinum*.

Awn of the lemma 15 mm. or less long.

Glumes all narrow and bristle-like. 4. *H. nodosum*.

4 of the 6 glumes widened above the base. 5. *H. pusillum*.



Fig. 231. *Hordeum vulgare* (Cultivated Barley).

1. HORDEUM VULGARE L.

[Fig. 231]

Four Rowed Barley. Cultivated Barley.

Hordeum sativum Jessen.

[Hitchcock, A Text-Book of Grasses, p. 246.]

Annual; culms and leaves similar to those of wheat; auricles prominent; spikes densely flowered, 6-9 cm. long exclusive of the awn (10-15 cm. long); spikelets in

3's at each joint of the rachis; glumes about 8 mm. long, linear, pubescent, terminating in a slender awn; lemma about 1 cm. long, narrowed into a scabrous flat awn, 1 cm. long. *Hordeum vulgare trifurcatum* Wenderoth is a beardless variety.

This is our common cultivated Barley which has escaped and may be found in waste places and along rail roads.

Distribution in Pennsylvania.

Allegheny: Along railroad between Freedom and Rochester, Pa. June 30, 1885, J. A. S. Crawford: Along the railroad near the station at Hartstown, Aug. 1, 1918, E. M. G.

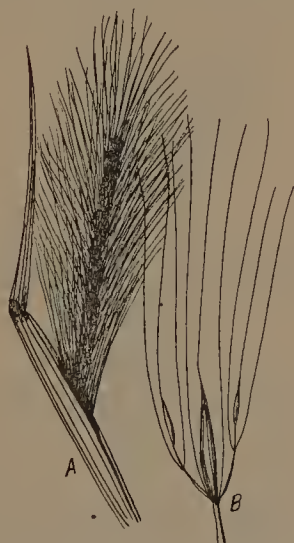


Fig. 232. *Hordeum jubatum* (Squirrel-tail Grass).
A. Inflorescence; B. Group of Spikelets.

2. HORDEUM JUBATUM L.

[Fig. 232]

Squirrel-tail Grass.

A winter annual, biennial or perennial; culms smooth, erect, 3-7 dm. high; sheaths smooth; blades 2-12 cm. long, 2-5 mm. wide, rough; spikelet 5-12 cm. long, nodding, about as wide as long including the spreading awns; spikelet in 3's, central one containing a perfect flower, the lateral ones reduced to 1-3 spreading awns; glumes of the perfect spikelets awn-like, 3-6 cm. long, spreading; lemma 6-8 mm. long, with an awn as long as the glumes; all the awns slender and scabrous. June-August.

This grass is found in dry soil from Ontario to Alaska, south to Illinois, Texas and California; also along the eastern coast from Labrador and Quebec to New Jersey and northern Pennsylvania, Edna Mosher (The Grasses of Illinois, p. 410. 1918) says, "It is one of the worst weeds in the state, not only because it crowds out useful plants, but because the awns are very troublesome to live stock. Any scheme of cultivation that prevents its ripening seed will control it. It is, however, more apt to come up in pastures and waste places which cannot well be cultivated, and as it ripens a large number of seeds, it may spread very rapidly." Fortunately it is rare in Pennsylvania.

Distribution in Pennsylvania.

Dauphin: Italian Park, Harrisburg, Aug. 25, 1921, E. M. G. Delaware: Along railroad, Chester, July 22, 1920, E. M. G. Erie: Presque

Isle, Sept. 3, 1916, John Bright. Lawrence: Streets of New Wilmington, June 1887, B. H. P.



Fig. 233. *Hordeum murinum* (Wall or Way Barley).

3. **HORDEUM MURINUM** L.

[Fig. 233]

Wall or Way Barley.

Way Bent.

A rather low spreading annual; culms 3-6 dm. tall, erect or decumbent at the base, smooth and glabrous; sheaths loose, uppermost inflated and sometimes enclosing the base of the spike; blades 3-18 cm. long, 2-3 mm. wide, lower ones lax, upper ones more rigid, somewhat rough; spikes 4-10 cm. long; spikelets usually in 3's; glumes awn-like, scabrous, those of the central spikelet wider and ciliate on the margins, those of the lateral spikelets narrow and only the first one ciliate on one margin, all glumes are awned; the lemmas are all broader than the glumes, and the one on the middle spikelet is the smallest. All are very long awned (about 3 cm.)

A marked characteristic of this species is the conspicuously ciliate glumes of the central spikelet. The grass was introduced from Europe and is found sparingly in waste places from Massachusetts to the District of Columbia; also in the western part of the United States. No specimen from Pennsylvania has been seen. Porter (Porter's Flora) reports it from Philadelphia. Probably only a transient.



Fig. 234. *Hordeum nodosum* (Meadow Barley).

4. **HORDEUM NODOSUM** L.

[Fig. 234]

Meadow Barley.

Hordeum pratense Huds.

An annual; culms 1.5-6 dm. high, simple, smooth; sheaths shorter than the internodes; blades 4-12 cm. long, 2-6 mm. wide, rough; spikes 2-8 cm. long; spikelets usually in 3's, central spikelet containing a perfect flower, the lateral spikelets an imperfect or rudimentary one; glumes of all three spikelets narrow and awnlike; lemma of the central spikelet 6-8 mm. long, tapering into an awn of about the same length; lemmas of the lateral spikelets much smaller and acute. June-July.

This species is found in dry soils in meadows and waste places from Indiana to Minnesota and westward to Alaska, Texas, and California, and locally eastward. It has been reported from Bucks County, Pennsylvania, by Porter (Porter's Flora). No specimen from the state has been seen.



Fig. 235. *Hordeum pusillum* (Little Barley).

5. HORDEUM PUSILLUM Nutt.

[Fig. 235]

Little Barley.

An annual; culms 1-4 dm. high; sheaths smooth, loose; blades 2-6 cm. long, erect, rough; spikes 2-7 cm. long; spikelets usually in 3's, central one containing a perfect flower, the lateral ones an imperfect or abortive one; both glumes of the central spikelets and the inner glume of the lateral spikelets widened above the base, the outer glume of each lateral spikelet awnlike, all glumes with awns 1-1.5 cm. long; lemma of the central spikelet 6-8 mm. long, tapering into an awn of about equal length; lemmas of the lateral spikelets much smaller and acute. May-July.

This species is sometimes confused with *H. nodosum* from which it may be distinguished by the difference in the glumes. In *H. nodosum* the glumes of all spikelets are narrow and awn-like while in *H. pusillum* the glumes of the central spikelet and the inner one of each lateral spikelet are widened above the base.

It is found in dry soil from Ohio to Missouri and westward, also sparingly in places eastward along the coast.

The only known specimen from Pennsylvania is one collected at Perkaspie, Bucks County, June 16, 1896, by F. L. Bassett, Herb. Phila. Acad. Sc.

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GLOSSARY

ACUMINATE.....	Tapering at the end; long acute.
ACUTE.....	Terminating in a sharp angle of less than 90 degrees.
ADVENTIVE.....	Imperfectly naturalized.
ALTERNATE.....	Not opposite; arranged singly at different heights.
ANNUAL.....	Of only one year's duration. (A winter annual is a plant from autumn sown seed which matures the following season).
ANTHER.....	The pollen-bearing part of the stamen.
ANTHESIS.....	The time of opening of a flower.
APPRESSED.....	Lying closely against another organ or part.
ARISTATE.....	Awned or bristle-tipped.
ARTICULATE.....	Jointed.
ASCENDING.....	Directed obliquely upward, or curving upward.
AURICLE.....	An ear-shaped appendage.
AWL-SHAPED.....	Tapering to a slender or rigid point.
AWN.....	A bristle-like organ or appendage; the continuation of the nerves of bracts, sometimes variously twisted.
AXIL.....	The angle formed by a leaf or branch with the stem.
AXILLARY.....	Situated in an axil.
AXIS.....	The central line of any organ or support of a group of organs.
BARBED.....	Furnished with rigid points or short bristles, usually reflexed like the barb of a fish-hook.
BEAKED.....	Ending in a prolonged tip.
BEARDED.....	Bearing long hairs in tufts or over small areas.
BIDENTATE.....	Having two teeth.
BIFID.....	Two-cleft.
BLADE.....	The expanded part of a leaf, sepal, or petal.
BRACT.....	A more or less modified leaf subtending a flower or belonging to an inflorescence.
BULB.....	A leaf bud with fleshy scales or coats; usually subterranean.
CAESPITOSE.....	Growing in tufts; forming mats or turf.
CALLUS.....	A hard projection; in grasses, the base of the mature floret, the callus being pilose in some genera.
CANESCENT.....	Hoary with gray pubescence.
CAPILLARY.....	Hair-like.
CAPITATE.....	Borne in a head or dense cluster.
CARYOPSIS.....	The dry indehiscent one-seeded fruit of grasses, in which the pericarp is adherent to the seed, as the grain of wheat or corn.
CESPITOSE.....	(See <i>caespitose</i> .)
CHAFF.....	Dry bracts.
CHAFFY.....	Having or resembling chaff.
CHARTACEOUS.....	Having the texture of writing paper.
CILIATE.....	Fringed with hairs on the edge.
CLAVATE.....	Club-shaped.
COMPRESSED.....	Flattened.
CONVOLUTE.....	Rolled up longitudinally.
CORDATE.....	Heart-shaped; with two rounded lobes at base.
CORIACEOUS.....	Leathery in texture.
CORM.....	An enlarged solid fleshy base of a stem.
CREeping.....	Extending along or just below the surface of the ground and rooting.
CUCULATE.....	Hood-shaped.
CULM.....	The stem of sedges and grasses.
CUNEATE.....	Wedge-shaped.
DECUMBENT.....	Reclining, but with the end ascending.
DEPRESSED.....	Somewhat flattened from above.
DIFFUSe.....	Loosely or widely spreading.
DIGITATE.....	Compound, the similar parts radiating from a common point.
DIOECIOUS.....	Unisexual, the staminate and pistillate flowers borne on different individuals.

DORSAL	Upon or relating to the back or outer surface of an organ.
EROSE	As if gnawed.
EXCURRENT	Running out, as a nerve of a leaf projecting beyond the margin.
EXSERTED	Projecting beyond an envelope.
FASCICLE	A close bundle or cluster.
FILAMENT	The part of the stamen which support the anther; any thread-like body.
FLEXUOUS	Zigzag; bending alternately in opposite directions.
FLOCCOSE	Clothed with flocks of soft hair or wool.
FLORET	Each flower of a spikelet, together with its subtending lemma and palea.
GENICULATE	Bent abruptly, like a knee.
GIBBOUS	Swollen on one side.
GLABROUS	Smooth in the sense of not pubescent or hairy.
GLANDULAR	Gland-bearing, gland-like.
GLAUCOUS	Covered or whitened with a bloom.
GLUMACEOUS	Furnished with or resembling glumes.
GLUME	A chaff-like bract; specifically one of the two empty chaffy bracts at the base of the spikelet in the grasses.
HEART-SHAPED	Ovate with two rounded lobes and a sinus at the base; commonly used to define such a base.
HERB	A plant with no persistent woody stem above ground.
HERBACEOUS	With characters of an herb.
HIRSUTE	Pubescent with rather coarse or stiff hairs.
HISPID	Beset with rigid or bristly hairs.
HOARY	Grayish-white with a fine close pubescence.
HYALINE	Transparent or translucent.
INDIGENOUS	Native and original to the region.
INDURATED	Hardened.
INFLORESCENCE	The flowering part of a plant, and especially the mode of arrangement of the flowers on the stem.
INTERNODE	The portion of a stem between two nodes.
KEEL	A central dorsal ridge, like the keel of a boat.
LEMMA	The lower of the two bracts inclosing the flower in the grasses; the upper one is the palea.
LIGULE	In grasses a thin often scarious or hairy projection from the summit of the sheath.
LINEAR	Long and narrow, with parallel margins.
MEMBRANACEOUS	Thin, rather soft, and more or less translucent.
or	
MEMBRANOUS	
MIDRIB	The central or main rib.
MONOECIOUS	With stamens and pistils in separate flowers on the same plant.
MURICATE	Rough with short hard points.
NERVE	A simple or unbranched vein or slender rib.
NEUTER	Without stamens or pistils.
NODE	In grasses the point of the stem from which originate the leaf-sheath and branches.
OBOVATE	Inverted ovate.
OBSOLETE	Not evident; rudimentary.
OBTUSE	Blunt or rounded at the end.
OVATE	Egg-shaped, with the broader end downward.
PALEA	The upper bract which encloses the flower in grasses.
PANICLE	A loose and more or less branched inflorescence with pedicellate flowers or spikelets.
PEDICEL	The stalk of a single flower or a spikelet.
PERENNIAL	Lasting year after year.
PERFECT	Said of a flower with both stamens and pistil.
PERSISTENT	Long continuous.
PILOSE	Hairy, especially with soft hairs.
PISTIL	The seed-bearing organ of the flower, composed of ovary, style, and stigma.
PISTILLATE	Provided with pistils but no stamens.
PLUMOSE	Feathery or feather-like.
POLLEN	The fecundating grains contained in the anther.

PROCUMBENT	Lying on the ground or trailing but not rooting at the nodes.
PROSTRATE	Lying quite flat on the ground.
PUBERULENT	Minutely pubescent.
PUBESCENT	Covered with short soft hairs.
PULVERULENT	Powdered; appearing as if covered with minute grains of dust.
RACEME	An inflorescence in which the flowers or spikelets are supported on pedicels along a common axis.
RACHILLA	The axis of the spikelet, the continuation of the branch, to which the glumes, lemma, and palea are attached.
RACHIS	The main axis or any of the branches to which the spikelets are attached.
REFLEXED	Abruptly bent or turned downward.
RETROSE	Directed downward or backward.
RHIZOME	A subterranean stem, usually rooting at the nodes and becoming erect at the apex.
ROOT-STOCK	Same as rhizome.
RUNNER	A slender stolon.
SCABROUS	Rough to the touch.
SCARIOUS	Thin, dry, and membranaceous, not green.
SECUND	Arranged on one side only, as flowers or leaves on a stalk.
SERRATE	Having sharp teeth pointing forward.
SERRULATE	Finely serrate.
SESSILE	Without footstalk of any kind.
SETACEOUS	Bristle-like.
SHEATH	In grasses the lower part of the leaf which envelopes the stem or culm.
SMOOTH	Either opposed to scabrous, i. e., not rough, or to glabrous, i. e., not pubescent; the former is the more correct application.
SPIKE	A form of inflorescence in which the spikelets are sessile on the axis.
SPIKELET	In grasses the name applied to the cluster of one or more flowers subtended by the glumes.
STAMEN	One of the pollen-bearing organs of the flowers.
STERILE	Unproductive, as a flower without pistil, or a stamen without an anther.
STIGMA	The part of the pistil which receives the pollen. In grasses the stigmas are usually plumose or feathery.
STIPULE	An appendage at the base of a petiole.
STOLON	A runner, or any basal branch that is disposed to root.
STOLONIFEROUS	Producing stolons.
STRICT	Very straight and upright.
STYLE	The portion of the pistil connecting the stigma and ovary.
SUBULATE	Awl-shaped.
TOMENTOSE	Densely pubescent with matted wool.
TRUNCATE	Ending abruptly, as if cut off transversely.
TUMID	Swollen.
VERRUCOSE	Covered with wart-like elevations.
VILLOUS	Bearing long soft hairs.
VISCID	Glutinous; sticky.
WOOLLY	Clothed with long matted hairs.

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¹Synonyms are in *italic* type.

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